RAMAIAH UNIVERSITY OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Programme Structure and Course Details of

B. Pharm Degree Programme

AY 2026-27

(Revisions approved in the 11th BOS held on 9th June 2026)

Faculty of Pharmacy

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

University's Vision, Mission and Objectives

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

Vision

MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

Mission

Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamwork in all our endeavors. We inspire critical thinking, personal development and a passion for lifelong learning. We serve the technical, scientific and economic needs of our Society.

Objectives

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunities in thesociety by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of our future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrich the experiences of faculties and students through research and developmental programmes

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Faculty's Vision and Mission

Vision

Aspires to create skilled and competent pharmacy professionals by imparting quality education in pharmaceutical sciences to meet the global health challenges for the betterment of mankind

Mission

M1 - To impart quality education to develop pharmacy professionals to lead the progress in global healthcare

M2 - To evolve into center of excellence in pharmaceutical research

M3 - To create entrepreneurs and problem solvers in multi-disciplinary arena

M4 – To inculcate professional ethics and passion for lifelong learning

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Faculty	Pharmacy
Programme Code	009
Programme Name	B. Pharm.
Dean of the Faculty	Dr. S. Bharath

1. **Title of the Award:** Bachelor of Pharmacy
2. **Mode of Study:** Full-Time
3. **Awarding Institution /Body:** M. S. Ramaiah University of Applied Sciences, Bengaluru
4. **Joint Award:** Not Applicable
5. **Teaching Institution:** Faculty of Pharmacy, M. S. Ramaiah University of Applied Sciences, Bengaluru
6. **Date of Programme Specifications:** May 2026
7. **Date of Programme Approval by the Academic Council of MSRUAS:** 06 April 2017
8. **Next Review Date:** April 2029
9. **Programme Approving Regulating Body and Date of Approval:** Pharmacy Council of India
10. **Programme Accredited Body and Date of Accreditation:** Not Applicable
11. **Grade Awarded by the Accreditation Body:** Not Applicable
12. **Programme Accreditation Validity:** Not Applicable
13. **Programme Benchmark:** Not Applicable
14. **Rationale for the Programme**

Pharmacists play a vital role in the health care system from manufacturing to dispensing of medications including educating the patients regarding rational use of the prescribed drugs. The spectrum of pharmacy profession is very wide, as it covers numerous opportunities in the pharma Industry-R&D, manufacturing and retail, healthcare sector, pharmacy education and regulatory bodies.

Globally, the availability of professionals in terms of pharmacist to population ratio is inadequate. The rapid development and diversification of pharmaceutical industries and health care sector has created ample opportunities for pharmacy graduates at national and international level. Among the biggest factors fueling the growth are contract research for Pharma R&D and manufacturing for global pharma companies. The retail sector is also witnessing growth due to entry of major retail chains.

M.S. Ramaiah College of Pharmacy, now a constituent of MSRUAS as Faculty of Pharmacy, has been in existence for almost three decades. The institution has produced over 2000 graduates, 600 postgraduates and several doctorates. Over the years, institutions have grown and evolved as one of the Premier Institutions in the state of Karnataka. The University infrastructure with latest technologies empowers the students with in-depth knowledge and practical skills to pursue high end research and innovation.

The Faculty of Pharmacy offers outcome based four-year B. Pharm. degree programme blending the art of science, technology and human relationships in a unique fashion. The multidisciplinary Faculty environment of the University provides holistic learning experience enabling students to

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

think critically and acquire practical skills for the smooth transition from academics to competitive professional environment.

15. Programme Mission

The purpose of the programme is to create innovators in multi-disciplinary settings, entrepreneurs and leaders with knowledge, understanding, cognitive abilities, practical and transferable skills gained through systematic and rigorous learning in the chosen academic domain.

16. Graduate Attributes (GAs)

GA-1. **Pharmacy Knowledge:** Ability to acquire knowledge and comprehend the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

GA-2. **Planning Abilities:** Ability to demonstrate effective planning including time management, resource management, delegation skills and organizational skills. Also to develop and implement plans and organize work to meet deadlines.

GA-3. **Problem analysis:** Ability to utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and make defensible decisions.

GA-4. **Modern tool usage:** Ability to learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

GA-5. **Leadership skills:** Ability to understand and consider the human reaction to change, motivation issues, leadership and team building when planning changes required for fulfillment of practice, professional and societal responsibilities. Also to assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

GA-6. **Professional Identity:** Ability to understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

GA-7. **Pharmaceutical Ethics:** Ability to honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

GA-8. **Communication:** Ability to communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, give and receive clear instructions.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

GA-9. The Pharmacist and society: Ability to apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

GA-10. Environment and sustainability: Ability to understand the impact of professional pharmacy solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

GA-11. Life-long learning: Ability to recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

17. Programme Outcomes (POs)

B. Pharm. graduates will be able to:

PO-1. Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

PO-2. Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO-3. Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and make defensible decisions.

PO-4. Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO-5. Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

PO-6. Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

PO-7. Pharmaceutical Ethics: Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

Ramyanth K.V.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

PO-8. Communication: Communicate effectively with the pharmacy community and with society at large, such as being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

PO-9. The Pharmacist and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO-10. Environment and sustainability: Understand the impact of professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-11. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

18. Programme Goal

The Programme goal is to produce fully trained pharmacists with knowledge and understanding of formulations, manufacture and evaluation of dosage forms; and the ability to think independently, to pursue a career in the domain of Pharmacy

19. Program Educational Objectives (PEOs)

The objectives of the B. Pharm Programme are to:

PEO 1: Knowledge: To produce graduates with adequate knowledge regarding basic principles of pharmaceutical sciences

PEO 2: Skill Development: To impart analytic and cognitive skills required to develop innovative solutions to solve problems in pharmaceutical industries and society

PEO 3: Preparation: To prepare students with leadership and entrepreneurial skills and to provide lifelong learning opportunities for a career in academia, industry and commerce thereby enabling them to develop into proficient professionals

PEO 4: Professionalism: To inculcate strong human values and enhance interpersonal skills to create awareness regarding healthcare issues for the improvement of society

20. Programme Specific Outcomes (PSOs)

At the end of the B. Pharm program, the graduate will be able to:

PSO-1. Apply fundamental knowledge and basic practical skills in pharmaceutical sciences to develop safe and effective solutions for healthcare problems

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

PSO-2. Engage in lifelong learning through continuous professional growth, practical training, and skill-based certifications, while developing leadership abilities

21. Programme Structure:

Table 1 Programme Structure

Semester 1							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	BPC101	Human Anatomy and Physiology I Theory	3	1	0	4	100
2	BPC102	Pharmaceutical Analysis I Theory	3	1	0	4	100
3	BPC103	Pharmaceutics I Theory	3	1	0	4	100
4	BPC104	Pharmaceutical Inorganic Chemistry Theory	3	1	0	4	100
5	BPC105	Communication skills Theory*	2	0	0	2	50
6	BPC106/ BPC107	Remedial Mathematics*/ Remedial Biology/	2	0	0	2	50
7	BPL108	Human Anatomy and Physiology I Practical	0	0	4	2	50
8	BPL109	Pharmaceutical Analysis I Practical	0	0	4	2	50
9	BPL110	Pharmaceutics I Practical	0	0	4	2	50
10	BPL111	Pharmaceutical Inorganic Chemistry Practical	0	0	4	2	50
11	BPL112	Communication skills Practical*	0	0	2	1	25
12	BPL113	Remedial Biology Practical*	0	0	2	1	25
		Total	16	4	20	27/29$/30#	750
		Total number of contact hours per week		36/38$/40#			

*Faculty Examination

$Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM) course.

#Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB) course.

Semester 2							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	BPC114	Human Anatomy and Physiology II Theory	3	1	0	4	100
2	BPC115	Pharmaceutical Organic Chemistry I Theory	3	1	0	4	100
3	BPC116	Biochemistry Theory	3	1	0	4	100
4	BPC117	Pathophysiology Theory	3	1	0	4	100
5	BPC118	Computer Applications in Pharmacy Theory*	3	0	0	3	75

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6	BPC119	Environmental Sciences Theory*	3	0	0	3	75
7	BPL120	Human Anatomy and Physiology II Practical	0	0	4	2	50
8	BPL121	Pharmaceutical Organic Chemistry I Practical	0	0	4	2	50
9	BPL122	Biochemistry Practical	0	0	4	2	50
10	BPL123	Computer Applications in Pharmacy Practical*	0	0	2	1	25
		Total	**18**	**4**	**14**	**29**	**725**
		Total number of contact hours per week		**36**			

*Faculty Examination

Semester 3							
Sl. No.	**Code**	**Course Title**	**Theory (h/W/S)**	**Tutorials (h/W/S)**	**Practical (h/W/S)**	**Total Credits**	**Max. Marks**
1	BPC224	Pharmaceutical Organic Chemistry II Theory	3	1	0	4	100
2	BPC225	Physical Pharmaceutics I Theory	3	1	0	4	100
3	BPC226	Pharmaceutical Microbiology Theory	3	1	0	4	100
4	BPC227	Pharmaceutical Engineering Theory	3	1	0	4	100
5	BPL228	Pharmaceutical Organic Chemistry II Practical	0	0	4	2	50
6	BPL229	Physical Pharmaceutics I Practical	0	0	4	2	50
7	BPL230	Pharmaceutical Microbiology Practical	0	0	4	2	50
8	BPL231	Pharmaceutical Engineering Practical	0	0	4	2	50
		Total	**12**	**4**	**16**	**24**	**600**
		Total number of contact hours per week		**32**			

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Semester 4							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	BPC232	Pharmaceutical Organic Chemistry III Theory	3	1	0	4	100
2	BPC233	Medicinal Chemistry I Theory	3	1	0	4	100
3	BPC234	Physical Pharmaceutics II Theory	3	1	0	4	100
4	BPC235	Pharmacology I Theory	3	1	0	4	100
5	BPC236	Pharmacognosy and Phytochemistry I Theory	3	1	0	4	100
6	BPL237	Medicinal Chemistry I Practical	0	0	4	2	50
7	BPL238	Physical Pharmaceutics II Practical	0	0	4	2	50
8	BPL239	Pharmacology I Practical	0	0	4	2	50
9	BPL240	Pharmacognosy and Phytochemistry I Practical	0	0	4	2	50
		Total	15	5	16	28	700
Total Number of Contact Hours per week			36				

Semester 5							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	BPC341	Medicinal Chemistry II Theory	3	1	0	4	100
2	BPC342	Industrial Pharmacy I Theory	3	1	0	4	100
3	BPC343	Pharmacology II Theory	3	1	0	4	100
4	BPC344	Pharmacognosy and Phytochemistry II Theory	3	1	0	4	100
5	BPC345	Pharmaceutical Jurisprudence Theory	3	1	0	4	100
6	BPL346	Industrial Pharmacy Practical	0	0	4	2	50
7	BPL347	Pharmacology II Practical	0	0	4	2	50
8	BPL348	Pharmacognosy and Phytochemistry II Practical	0	0	4	2	50
		Total	15	5	12	26	650
Total number of contact hours per week			32				

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Semester 6							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	BPC349	Medicinal Chemistry III Theory	3	1	0	4	100
2	BPC350	Pharmacology III Theory	3	1	0	4	100
3	BPC351	Herbal Drug Technology Theory	3	1	0	4	100
4	BPC352	Biopharmaceutics and Pharmacokinetics Theory	3	1	0	4	100
5	BPC353	Pharmaceutical Biotechnology Theory	3	1	0	4	100
6	BPC354	Quality Assurance Theory	3	1	0	4	100
7	BPL355	Medicinal chemistry III Practical	0	0	4	2	50
8	BPL356	Pharmacology III Practical	0	0	4	2	50
9	BPL357	Herbal Drug Technology Practical	0	0	4	2	50
		Total	**18**	**6**	**12**	**30**	**750**
Total Number of Contact Hours per week			**36**				

Semester 7							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	BPC458	Instrumental Methods of Analysis Theory	3	1	0	4	100
2	BPC459	Industrial Pharmacy II Theory	3	1	0	4	100
3	BPC460	Pharmacy Practice Theory	3	1	0	4	100
4	BPC461	Novel Drug Delivery System Theory	3	1	0	4	100
5	BPL462	Instrumental Methods of Analysis Practical	0	0	4	2	50
6	BPM463-PC	Practice School - Pharmaceutical Chemistry	0	0	12	6	150
7	BPM463-PG	Practice School - Advanced Herbal Drug Technology					
	BPM463-PL	Practice School- Animal Facility Management and Pharmacological Screening Techniques					
	BPM463-PP	Practice School- Pharmacy Practice					
	BPM463-PS	Practice School - Pharmaceutical Manufacturing Science					
		Total	**12**	**4**	**16**	**24**	**600**
Total Number of Contact Hours per week			**32**				

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramanath K.V.
Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Semester 8							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	BPC464	Biostatistics and Research Methodology Theory	3	1	0	4	100
2	BPC465	Social and Preventive Pharmacy Theory	3	1	0	4	100
3	BPE466	Pharma Marketing Management Theory	3 + 3 = 6	1+1=2	0	4+4=8	100 + 100 = 200
4	BPE467	Pharmaceutical Regulatory Science Theory			0		
5	BPE468	Pharmacovigilance Theory			0		
6	BPE469	Quality Control and Standardization of Herbals Theory			0		
7	BPE470	Computer Aided Drug Design Theory			0		
8	BPE471	Cell and Molecular Biology Theory			0		
9	BPE472	Cosmetic Science Theory			0		
10	BPE473	Experimental Pharmacology Theory			0		
11	BPE474	Advanced Instrumentation Techniques Theory			0		
12	BPE475	Dietary Supplements and Nutraceuticals Theory			0		
13	BPP476	Project Work	12	0	0	6	150
		Total	**24**	**4**	**0**	**22**	**550**
Total Number of Contact Hours per week			**28**				

22. Course Delivery: As per the Timetable

23. Teaching and Learning Methods

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures
5. Laboratory work/Field work/Workshop
6. Industry Visit
7. Seminars
8. Group Exercises
9. Project Work
10. Project
11. Exhibitions
12. Technical Festivals

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

24. Assessment and Grading

Semester I

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC101	Human Anatomy and Physiology I Theory	10	15	1 h	25	75	3 h	100
BPC102	Pharmaceutical Analysis I Theory	10	15	1 h	25	75	3 h	100
BPC103	Pharmaceutics I Theory	10	15	1 h	25	75	3 h	100
BPC104	Pharmaceutical Inorganic Chemistry Theory	10	15	1 h	25	75	3 h	100
BPC105	Communication skills Theory*	5	10	1 h	15	35	1.5 h	50
BPC106/ BPC107	Remedial Mathematics*/ Remedial Biology	5	10	1 h	15	35	1.5 h	50
BPL108	Human Anatomy and Physiology I Practical	5	10	4 h	15	35	4 h	50
BPL109	Pharmaceutical Analysis I Practical	5	10	4 h	15	35	4 h	50
BPL110	Pharmaceutics I Practical	5	10	4 h	15	35	4 h	50
BPL111	Pharmaceutical Inorganic Chemistry Practical	5	10	4 h	15	35	4 h	50
BPL112	Communication skills Practical*	5	5	2 h	10	15	2 h	25
BPL113	Remedial Biology Practical*	5	5	2 h	10	15	2 h	25

*Faculty Examination

Semester II

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC114	Human Anatomy and Physiology II Theory	10	15	1 h	25	75	3 h	100
BPC115	Pharmaceutical Organic Chemistry I Theory	10	15	1 h	25	75	3 h	100
BPC116	Biochemistry Theory	10	15	1 h	25	75	3 h	100
BPC117	Pathophysiology Theory	10	15	1 h	25	75	2 h	100
BPC118	Computer Applications in Pharmacy Theory*	10	15	1 h	25	50	1.5 h	75
BPC119	Environmental Sciences Theory*	10	15	1 h	25	50	1.5 h	75
BPL120	Human Anatomy and Physiology II Practical	5	10	4 h	15	35	4 h	50
BPL121	Pharmaceutical Organic Chemistry I Practical	5	10	4 h	15	35	4 h	50
BPL122	Biochemistry Practical	5	10	4 h	15	35	4 h	50
BPL123	Computer Applications in Pharmacy Practical*	5	5	2 h	10	15	4 h	25

*Faculty Examination

Semester III

Course code	Name of Course	Internal Assessment	Semester End Examination	Total marks

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC224	Pharmaceutical Organic Chemistry II Theory	10	15	1 h	25	75	3h	100
BPC225	Physical Pharmaceutics I Theory	10	15	1 h	25	75	3h	100
BPC226	Pharmaceutical Microbiology Theory	10	15	1 h	25	75	3h	100
BPC227	Pharmaceutical Engineering Theory	10	15	1 h	25	75	3h	100
BPL228	Pharmaceutical Organic Chemistry II Practical	5	10	4 h	15	35	4	50
BPL229	Physical Pharmaceutics I Practical	5	10	4 h	15	35	4 h	50
BPL230	Pharmaceutical Microbiology Practical	5	10	4 h	15	35	4 h	50
BPL231	Pharmaceutical Engineering Practical	5	10	4 h	15	35	4 h	50

Semester IV

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC232	Pharmaceutical Organic Chemistry III Theory	10	15	1 h	25	75	3 h	100
BPC233	Medicinal Chemistry I Theory	10	15	1 h	25	75	3 h	100
BPC234	Physical Pharmaceutics II Theory	10	15	1 h	25	75	3 h	100
BPC235	Pharmacology I Theory	10	15	1 h	25	75	3 h	100
BPC236	Pharmacognosy and Phytochemistry I Theory	10	15	1 h	25	75	3 h	100
BPL237	Medicinal Chemistry I Practical	5	10	4 h	15	35	4 h	50
BPL238	Physical Pharmaceutics II Practical	5	10	4 h	15	35	4 h	50
BPL239	Pharmacology I Practical	5	10	4 h	15	35	4 h	50
BPL240	Pharmacognosy and Phytochemistry I Practical	5	10	4 h	15	35	4 h	50

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Semester V

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC341	Medicinal Chemistry II Theory	10	15	1 h	25	75	3 h	100
BPC342	Industrial Pharmacy I Theory	10	15	1 h	25	75	3 h	100
BPC343	Pharmacology II Theory	10	15	1 h	25	75	3 h	100
BPC344	Pharmacognosy and Phytochemistry II Theory	10	15	1 h	25	75	3 h	100
BPC345	Pharmaceutical Jurisprudence Theory	10	15	1 h	25	75	3 h	100
BPL346	Industrial Pharmacy Practical	5	10	4 h	15	35	4 h	50
BPL347	Pharmacology II Practical	5	10	4 h	15	35	4 h	50
BPL348	Pharmacognosy and Phytochemistry II Practical	5	10	4 h	15	35	4 h	50

Semester VI

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC349	Medicinal Chemistry III Theory	10	15	1 h	25	75	3 h	100
BPC350	Pharmacology III Theory	10	15	1 h	25	75	3 h	100
BPC351	Herbal Drug Technology Theory	10	15	1 h	25	75	3 h	100
BPC352	Biopharmaceutics and Pharmacokinetics Theory	10	15	1 h	25	75	3 h	100
BPC353	Pharmaceutical Biotechnology Theory	10	15	1 h	25	75	3 h	100
BPC354	Quality Assurance Theory	10	15	1 h	25	75	3 h	100
BPL355	Medicinal chemistry III Practical	5	10	4 h	15	35	4 h	50
BPL356	Pharmacology III Practical	5	10	4 h	15	35	4 h	50
BPL357	Herbal Drug Technology Practical	5	10	4 h	15	35	4 h	50

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Semester VII

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC458	Instrumental Methods of Analysis Theory	10	15	1h	25	75	3h	100
BPC459	Industrial Pharmacy II Theory	10	15	1h	25	75	3h	100
BPC460	Pharmacy Practice Theory	10	15	1h	25	75	3h	100
BPC461	Novel Drug Delivery System Theory	10	15	1h	25	75	3h	100
BPL462	Instrumental Methods of Analysis – Practical	5	10	4 h	15	35	4 h	50
BPM463	Practice School*	25	-	-	25	125	5h	150

*Faculty Examination

Semester VIII

Course code	Name of Course	Internal Assessment				Semester End Examination		Total marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BPC464	Biostatistics and Research Methodology Theory	10	15	1h	25	75	3h	100
BPC465	Social and Preventive Pharmacy Theory	10	15	1h	25	75	3h	100
BPE466	Pharma Marketing Management Theory	10 + 10	15 + 15	1h + 1h = 2h	25 + 25 = 50	75 + 75 = 150	3h + 3h = 6 h	100
BPE467	Pharmaceutical Regulatory Science Theory							100
BPE468	Pharmacovigilance Theory							100
BPE469	Quality Control and Standardization of Herbals							100
BPE470	Computer Aided Drug Design							100
BPE471	Cell and Molecular Biology							100
BPE472	Cosmetic Science Theory							100
BPE473	Experimental Pharmacology							100
BPE474	Advanced Instrumentation Techniques							100
BPE475	Dietary Supplements and Nutraceuticals							100
BPP476	Project Work					150	4h	150

24.1 Components of Grading

There shall be **two components** of grading in the assessment of each course:

Component 1, Continuous Evaluation (CE): This component involves multiple subcomponents (SC1, SC2, etc.) of learning assessment. The assessment of the subcomponents of CE is conducted during the semester at regular intervals. This subcomponent represents the formative assessment of students' learning.

Component 2, Semester-end Examination (SEE): This component represents the summative assessment carried out in the form an examination conducted at the end of the semester.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Marks obtained CE and SEE components have a weightage of 25:75 (CE: 25% and SEE: 75%) in determining the final marks obtained by a student in a theory course while the Laboratory course will have a weightage of 30:70 (CE-30 % and SEE: 70%).

The complete details of Grading are given in the Academic Regulations.

24.2 Continuous Evaluation Policies

Continuous evaluation depends on the type of course as discussed below:

24.2.1 Theory Course

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1				
CO-2				
CO-3				
CO-4				
CO-5				
CO-6				
The details of SC1, SC2, and SC3 are presented in the Programme Specifications Document.				

24.2.2 Laboratory Course

For a laboratory course, the scheme for determining the CE marks is as under:

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Practical record/viva voce	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks ▶	2	3	10	
CO-1				
CO-2				
CO-3				
CO-4				
The details of SC1, SC2 and SC3 are presented in the Programme Specifications Document				

Dean
Faculty of Pharmacy
I.S. Ramaiah University of Applied Sciences
Bangalore-560

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

24.2.3 Skill enhancement courses

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (17% Weightage)			Component 2: SEE (83% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Teacher Student Interaction	Assignment	Report submission and Presentation 50+75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
CO-5		X	X	X
The details of SC1, SC2, and SC3 are presented in the Programme Specifications Document.				

Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	**Maximum Marks**
Attendance (Refer Table below)	4
Academic activities (Assignment and interaction with students)	6
Total	10
Laboratory	
Criteria	**Maximum Marks**
Attendance (Refer Table below)	2
Based on Practical Records, Regular viva voce, etc.	3
Total	5

Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

Two Sessional exams shall be conducted for each theory / laboratory course as per the schedule fixed. The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in Table – 2.

Sessional exam for theory shall be conducted for 30 marks and shall be computed for 15 marks.

Similarly, Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Question paper pattern for theory Sessional examinations

For courses having University exam

I. Multiple choice (Answer all Questions)		= 6×1=06
II. Objective Questions (Answer all Questions)		= 3×2=06
III. Short Answers (Answer 2 out of 3)		= 2×5=10
IV. Long Answers (Answer 1 out of 2)		= 1×8=08
	Total	**= 30 marks**

For courses having Faculty exam

I. Multiple choice (Answer all Questions)		= 6×1=06
II. Objective Questions (Answer all Questions)		= 3×2=06
III. Short Answers (Answer 2 out of 3)		= 2×5=10
IV. Long Answers (Answer 1 out of 2)		= 1×8=08
	Total	**= 30 marks**

Question Paper pattern for Laboratory sessional examination

I. Synopsis / Spotters		= 10
II. Experiments		= 25
III. Viva Voce		= 5
	Total	**= 40 marks**

Question paper pattern for Semester End theory examinations for 75 Marks paper

I. Objective Questions (Answer all Questions)		= 10×2=20
II. Long Answers (Answer 2 out of 3)		= 2×10=20
III. Short Answers (Answer 7 out of 9)		= 7×5=35
	Total	**= 75 marks**

For 50 Marks paper

I. Long Answers (Answer 2 out of 3)		= 2×10=20
II. Short Answers (Answer 6 out of 8)		= 6×5=30
	Total	**= 50 marks**

For 35 Marks paper

I. Long Answers (Answer 1 out of 2)		=1×10=10
II. Short Answers (Answer 5 out of 7)		= 5×5=25
	Total	**= 35 marks**

Question paper pattern for Semester End laboratory examinations

I. Synopsis /Spotters		= 5
II. Experiments		=25
III. Viva Voce		= 5
	Total	**= 35 marks**

25. Project work

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in a group. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages). The internal and external examiner appointed by the University shall evaluate the project at the time

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean- Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

of the Practical examinations of other semester(s). Students shall be evaluated in groups and the projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks
Total	**75 Marks**

Evaluation of Presentation:

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks
Total	**75 Marks**

Explanation: *The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.*

26. Industrial training

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital, after Semester IV. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

27. Practice School

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time. At the end of the practice school, every student shall submit a printed report (in triplicate), on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at the faculty level and grade point shall be awarded.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

28. Student Support for Learning

1. Course Notes
2. Reference Books in the Library
3. Magazines and Journals
4. Internet Facility
5. Computing Facility
6. Laboratory Facility
7. Workshop Facility
8. Staff Support
9. Lounges for Discussions
10. Any other support that enhances their learning

29. Quality Control Measures

1. Review of Course Notes
2. Review of Question Papers and Assignment Questions
3. Student Feedback
4. Moderation of Assessed Work
5. Opportunities for students to see their assessed work
6. Review by external examiners and external examiners reports
7. Staff Student Consultative Committee meetings
8. Student exit feedback
9. Subject Assessment Board (SAB)
10. Programme Assessment Board (PAB)

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

30. Programme Map (Course-PO-PSO Map)

Sem.	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
1	Human Anatomy and Physiology I Theory	3	0	3	0	0	1	2	3	2	3	3	3	0	0	3
1	Pharmaceutical Analysis-I Theory	3	2	2	2	-	-	1	1	1	1	1	3	1	-	1
1	Pharmaceutics - I Theory	3	3	3	3	1	3	2	2	3	2	3	3	3	2	3
1	Pharmaceutical Inorganic Chemistry Theory	3	2	2	1	1	2	2	2	2	1	-	3	2	2	2
1	Communication skills Theory*	-	-	-	-	-	-	-	1	3	3	-	-	-	2	2
1	Remedial Biology*	3	0	0	2	1	2	0	1	1	2	3	3	0	2	2
1	Remedial Mathematics*	2	2	2	3	-	-	-	-	-	-	-	2	3	-	-
1	Human Anatomy and Physiology I Practical	3	0	3	3	0	0	2	2	2	3	3	3	3	0	3
1	Pharmaceutical Analysis I Practical	3	1	2	1	-	-	2	1	1	1	2	3	2	-	2
1	Pharmaceutics – I Practical	3	3	2	3	-	3	1	2	2	3	3	3	3	2	3
1	Pharmaceutical Inorganic Chemistry Practical	3	1	1	1	-	-	1	1	-	-	1	3	2	1	2
1	Communication skills Practical*	-	-	-	1	1	-	-	2	2	3	-	-	2	-	2
1	Remedial Biology Practical*	3	0	3	3	0	0	0	0	2	3	3	3	0	0	3
2	Human Anatomy and Physiology II Theory	3	0	2	0	0	2	0	0	2	0	2	3	0	0	3
2	Pharmaceutical Organic Chemistry I Theory	3	2	2	3	-	-	-	1	-	-	1	3	3	-	3
2	Biochemistry Theory	3	-	2	1	-	-	1	1	1	1	2	3	-	-	2
2	Pathophysiology Theory	3	2	2	1	0	1	1	3	1	2	1	3	0	0	3
2	Computer Applications in Pharmacy Theory*	3	0	0	0	0	1	0	1	1	0	2	3	0	0	3
2	Environmental Sciences Theory*	3	0	0	0	0	1	0	1	1	0	2	3	0	0	3
2	Human Anatomy and Physiology II Practical	3	0	3	3	0	0	0	2	3	3	3	3	3	0	3
2	Pharmaceutical Organic Chemistry I Practical	3	1	1	2	-	-	1	1	-	-	1	2	1	-	1
2	Biochemistry Practical	3	2	2	1	-	-	2	2	1	-	2	3	-	-	3
2	Computer Applications in Pharmacy Practical*															
3	Pharmaceutical Organic Chemistry II Theory	3	2	2	3	-	-	3	1	1	2	2	3	3	-	2
3	Physical Pharmaceutics I Theory	3	2	3	2	1	1	1	1	2	1	1	3	3	-	-
3	Pharmaceutical Microbiology Theory	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
3	Pharmaceutical Engineering Theory	3	3	3	1	-	-	-	2	-	2	-	3	2	1	2

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean -
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3	Pharmaceutical Organic Chemistry II Practical	3	3	3	2	1	-	3	2	3	3	2	3	3	-	2
3	Physical Pharmaceutics I Practical	3	2	3	2	-	1	1	-	-	-	1	3	3	-	2
3	Pharmaceutical Microbiology Practical	3	3	3	3	3	2	3	3	2	2	3	3	3	3	3
3	Pharmaceutical Engineering Practical	3	3	3	3	1	-	-	2	-	2	1	3	3	1	1
4	Pharmaceutical Organic Chemistry III Theory	3	1	2	2	-	-	1	1	1	1	2	2	2	1	2
4	Medicinal Chemistry I Theory	3	1	2	2	1	1	1	1	1	1	1	3	2	2	2
4	Physical Pharmaceutics II Theory	3	2	3	3	1	1	2	2	2	3	3	3	3	2	3
4	Pharmacology I Theory	3	3	2	1	1	1	1	0	0	2	1	3	1	1	3
4	Pharmacognosy and Phytochemistry I Theory	3	2	3	3	1	-	3	3	3	3	3	3	3	1	3
4	Medicinal Chemistry I Practical	3	3	2	1	1	1	2	1	2	2	2	3	2	1	2
4	Physical Pharmaceutics II Practical	3	2	3	3	1	1	2	2	2	3	3	3	3	2	3
4	Pharmacology I Practical	2	1	2	2	2	0	1	0	1	1	2	3	1	1	3
4	Pharmacognosy and Phytochemistry I Practical	3	3	3	3	2	2	3	2	1	1	3	3	3	3	3
Sem	**Course Title**	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PSO-1**	**PSO-2**	**PSO-3**	**PSO-4**
5	Medicinal Chemistry II Theory	3	1	2	3	-	-	3	2	3	2	1	3	3	-	2
5	Industrial Pharmacy I Theory	3	2	3	3	1	-	2	2	3	3	3	3	3	2	3
5	Pharmacology II Theory	3	2	2	2	1	2	1	1	2	1	1	3	0	2	3
5	Pharmacognosy and Phytochemistry II Theory	3	2	3	3	-	-	2	-	-	-	3	3	3	-	3
5	Pharmaceutical Jurisprudence Theory	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3
5	Industrial Pharmacy I Practical	3	2	3	3	2	-	3	3	2	3	3	3	3	2	3
5	Pharmacology II Practical	3	2	2	2	1	2	1	1	2	1	1	3	0	0	3
5	Pharmacognosy and Phytochemistry II Practical	3	2	3	3	-	-	2	2	-	-	3	3	3	-	3
6	Medicinal Chemistry III Theory	3	3	3	3	-	-	3	1	1	2	2	2	2	2	1
6	Pharmacology III Theory	3	2	2	2	1	2	1	1	2	1	1	3	0	0	3
6	Herbal Drug Technology Theory	3	2	3	3	1	1	2	-	1	2	3	3	3	1	3
6	Biopharmaceutics and Pharmacokinetics Theory	3	3	3	3	2	2	2	3	2	3	3	3	3	2	3
6	Pharmaceutical Biotechnology Theory	3	2	3	3	-	-	2	-	-	-	3	3	3	1	3
6	Quality Assurance Theory	3	2	2	2	1	1	1	1	1	2	1	3	-	1	1
6	Medicinal chemistry III Practical	3	2	1	2	1	1	2	1	2	2	2	2	3	1	2
6	Pharmacology III Practical	3	1	1	2	1	2	2	1	2	1	1	3	3	0	3
6	Herbal Drug Technology Practical	3	3	3	3	2	2	3	2	1	1	3	3	3	2	3

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

7	Instrumental Methods of Analysis Theory	3	1	2	2	-	1	1	3	1	2	1	2	2	-	3
7	Industrial Pharmacy II Theory	3	3	3	3	1	2	2	2	3	3	2	3	3	2	3
7	Pharmacy Practice Theory	3	2	3	2	2	3	3	2	2	-	3	3	-	2	3
7	Novel Drug Delivery System Theory	3	3	3	3	2	3	2	3	3	2	3	3	3	3	3
7	Instrumental Methods of Analysis – Practical	3	2	3	1	-	1	2	1	1	-	1	2	2	-	2
7	Practice School* - PC	3	3	3	3	1	-	2	2	2	1	3	3	2	-	3
	Practice School* - PG	3	2	3	3	1	1	2	2	2	3	3	3	3	2	3
	Practice School* - PL	3	2	3	2	-	-	1	2	-	-	3	3	3	2	3
	Practice School* - PP	3	2	3	2	3	2	2	2	3	1	3	3	2	2	3
	Practice School* - PS	3	2	3	3	3	3	2	3	2	1	3	3	2	2	1
8	Biostatistics and Research Methodology	3	3	3	3	1	2	2	2	3	3	3	3	3	2	3
8	Social and Preventive Pharmacy	3	2	3	2	3	3	2	3	3	2	2	2	-	3	2
8	Pharma Marketing Management	3	3	2	-	2	2	3	2	2	-	3	2	-	2	3
8	Pharmaceutical Regulatory Science	3	3	2	2	1	2	2	2	2	1	2	3	2	2	2
8	Pharmacovigilance	3	2	3	2	2	3	3	3	2	2	2	2	-	2	2
8	Quality Control and Standardization of Herbals	3	2	3	2	2	2	1	3	1	1	3	3	3	2	2
8	Computer Aided Drug Design	3	3	3	3	2	-	2	1	2	2	1	3	2	-	2
8	Cell and Molecular Biology	3	3	3	3	2	2	1	2	1	0	1	3	0	2	3
8	Cosmetic Science	3	3	3	3	1	3	3	3	3	2	2	3	3	1	3
8	Experimental Pharmacology	3	3	2	2	1	0	1	2	1	1	1	3	1	1	3
8	Advanced Instrumentation Techniques	3	2	2	2	1	2	2	2	1	2	2	3	3	2	2
8	Dietary Supplements and Nutraceuticals	3	-	2	2	2	3	2	2	2	1	3	3	2	2	2
8	Project Work	3	3	3	3	3	2	2	3	2	2	2	3	2	2	3

31. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposia, paper writing, attending industry exhibitions, project competitions and related activities for enhancing their knowledge and networking.

32. Cultural and Literary Activities

Annual cultural festivals are held to showcase the creative talents in students. They are involved in planning and organizing the activities.

33. Sports and Athletics

Students are encouraged to take part in sports and athletic events regularly. Annual sports meet will be held to demonstrate sportsmanship and competitive spirit.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

RAMAIAH UNIVERSITY OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Course Specifications

B. Pharm

Programme Code: 009

Faculty of Pharmacy
(Batches 2025, 2024, 2023)

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 1

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Human Anatomy and Physiology I Theory

Course Title	Human Anatomy and Physiology I Theory
Course Code	BPC101
Course Type	Core Theory
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

This course deals with Anatomy and Physiology of the human body. This course is designed to impart fundamental knowledge on the structure and functions of various organ systems of the human body. It also helps in understanding various homeostatic mechanisms. This course facilitates students to gain better understanding on diseases, their treatment and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Describe the gross morphology, structure, and functions of organs and systems of the human body
- **CO-2** Explain the composition and functions of blood, body fluids, and cellular/tissue organization
- **CO-3** Analyze the coordinated functioning of different organ systems in the human body
- **CO-4** Discuss the role of homeostatic mechanisms in maintaining normal physiological functions and health

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1. Introduction to human body: Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology Cellular level of organization: Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine Tissue level of organization: Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues **10 hours**

Unit 2. Integumentary system: Structure and functions of skin Skeletal system: Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction Joints: Structural and functional classification, types of joints movements and its articulation **10 hours**

Unit 3. Body fluids and blood: Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo- endothelial system. Lymphatic system: Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system **10 hours**

Unit 4. Nervous system: Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity) **08 hours**

Unit 5. Cardiovascular system: Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart **07 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1						2			1	2			
CO-2						2			2	3			
CO-3						2			3	3			
CO-4						3			3	3			
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramyuth K.V.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Programme Specific Outcomes (PSOs)

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		05
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75 and both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Sembulingam, K., Sembulingam, P. (2016) Essentials of Medical Physiology 7th edn. New Delhi: Jaypee Brothers Medical Publishers.
2. Kathleen, J. W. W. (1996) Anatomy and Physiology in Health and Illness. New York: Churchill Livingstone.
3. Tortora Grabowski. (1992) Principles of Anatomy and Physiology 7th edn. New York: Harper and Collins.
4. Vasudeva, N., Mishra, S. (ed.)(2016) Inderbir Singh's Text book of Human Histology 8th edn. New Delhi: Jaypee Brother's Medical Publishers.
5. Ghai, C. L. (2012) Text book of Practical Physiology 8th edn. New Delhi: Jaypee Brother's Medical Publishers.

c. Recommended Reading

1. Tandon, O. P., Tripathi, Y. (ed.)(2011) Best and Taylor's Physiological Basis of Medical Practice 13th edn. Riverview, Mi, USA: Lippincott Williams & Wilkins Co.
2. Guyton, A. C., John, E. H. (2012) Text book of Medical Physiology 11th edn. Miamisburg, U.S.A: Elsevier.
3. Chatterjee, C. C. (2016) Human Physiology (vol 1 and 2) 11th edn. Kolkata: Academic Publishers.

d. Magazines and Journals

1. Indian Journal of Clinical Anatomy and Physiology, New Delhi: Innovative Publications.
2. International Journal of Anatomy & Applied Physiology, Delaware: Sci Doc Publishers.

e. Websites

1. www.anatomycorner.com
2. www.anatomyzone.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramanath K.V.
Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Analysis Theory

Course Title	Pharmaceutical Analysis Theory
Course Code	BPC102
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate students on the fundamental principles of Analytical Chemistry and their applications in pharmaceutical sciences and to prepare them for further study in the course discipline. This course also deals with the principles of electrochemical analysis of drugs.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the sources of errors in pharmaceuticals and methods to minimize them
- **CO-2** Summarise the basic concepts and principles of specified titrimetric methods
- **CO-3** Discuss the applications of titrimetric methods in pharmaceutical analysis
- **CO-4** Outline the techniques of Conductometry, Potentiometry and Polarography for analysis of pharmaceutical compounds

4. Course Contents

Pharmaceutical analysis- Definition and scope, Different techniques of analysis, Methods of expressing concentration, Primary and secondary standards, Preparation and standardization of various molar and normal solutions - Oxalic acid, sodium hydroxide, hydrochloric acid, sodium

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures, Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

10 hours

Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves

Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

10 hours

Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.

Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate

Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate, coprecipitation and post precipitation, Estimation of barium sulphate

Diazotisation: Basic Principles, methods and application of diazotisation titration

10 hours

Redox titrations

Concepts of oxidation and reduction, Types of redox titrations (Principles and applications): Cerimetry, Iodimetry, Iodometry, Bromometry, Dichrometry, Titration with potassium iodate

08 hours

Electrochemical methods of analysis

Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications

Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications

Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications.

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2	3											3	
CO-3			3									3	
CO-4	3		2									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		05
Total Duration in Hours		**65**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concern course leader/s.

Reassessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

1. Class notes
2. Mendham J, Denny RC, Barnes JD, Thomas MJK. *Vogel's Text book of Quantitative Chemical Analysis*. 6th edn. (2008). New Delhi: Dorling Kindersley (India) Pvt., Ltd., Licensees of Pearson Education in South Asia.
3. Beckett, AH. Stenlake, JB. (2004) *Practical Pharmaceutical Chemistry*, Vol I. London. The Athlone Press of the University of London.
4. Atherdon, LM. (ed.) (1969) *Bentley and Drivers' Textbook of Pharmaceutical Chemistry*. New Delhi: CBS Publishers in arrangement with Oxford University Press.

b. Recommended Reading

1. Loyd, VA Jr. (2013) *Remington. The Science and Practice of Pharmacy*. 22nd Edition. UK: Pharmaceutical Press.
2. Alexeyev, VN. (1994) *Quantitative Analysis*. New Delhi: CBS Publications.
3. India. Ministry of Health and Family welfare Govt. of India. (2014) *Indian Pharmacopoeia*.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7th Edition. Ghaziabad: Indian Pharmacopoeia commission.

c. Magazines and Journals

1. Indian Journal of Chemistry Section – A. Published by CSIR-NISCAIR, New Delhi.
2. Indian Journal of Pharmaceutical Sciences. Scientific Publication of the Indian Pharmaceutical Association, Bengaluru

d. Websites

1. http://www.chemseer.com/journals/journals_inorganic.shtml
2. http://www.web-formulas.com/
3. http://apps.who.int/phint/en/p/
4. www.ipc.gov.in

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutics-I (Theory)

Course Title	Pharmaceutics-I Theory
Course Code	BPC103
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart a fundamental knowledge of preparatory pharmacy with the art and science of dispensing varieties of dosage forms. The course facilitates the students to gain a better understanding of the profession of pharmacy including its history, scope, dosage forms, official standards, and official preparations.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the evolution of pharmacy profession and demonstrate professionalism in prescription handling
- **CO-2** Apply pharmaceutical calculations for dose determination and formulation of appropriate dosage forms.
- **CO-3** Design and develop stable pharmaceutical dosage forms with appropriate ingredients, labeling, and storage conditions
- **CO-4** Evaluate the quality and stability of pharmaceutical dosage forms as per official standards and recommend suitable corrective measures

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean- Academics
M.S. Ramaiah University of Applied Sciences

4. Course Contents

Unit 1 (Historical background and development of the profession of pharmacy):

History of the profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

Dosage forms

Introduction to dosage forms, classification and definitions

Prescription

Definition, Parts of prescription, handling of Prescription and Errors in prescription.

Posology

Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

10 Hours

Unit 2 (Pharmaceutical calculations):

Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders

Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

Liquid dosage forms

Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques. **10 hours**

Unit 3 (Monophasic liquids):

Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

Biphasic liquids

Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions Flocculated and Deflocculated suspension & stability problems and methods to overcome.

Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

08 hours

Unit 4 (Suppositories):

Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical incompatibilities

Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

Ophthalmic Preparations:

Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

08 hours

Unit 5 (Semisolid dosage forms):

Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semisolid dosage forms. Evaluation of semisolid dosage forms.

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3					2						3	
CO-2	3		3									3	
CO-3	3		3									3	
CO-4			3									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by the concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Howard C Ansel, Lloyd Allen. (2013) Ansel's Pharmaceutical Dosage form and Drug delivery systems. 10th Edition. New Delhi: Lippincott Williams and Wilkins.
2. Carter, S J. (2008) Cooper and Gunn's-Dispensing for Pharmaceutical students. 12th Edition. New Delhi: CBS Publishers.
3. Aulton, ME. (2001) Pharmaceutics: The Science of Dosage Form Design. 2nd Edition. Edinburgh: Churchill Livingstone.
4. Carter, S J. (2005) Cooper and Gunn's-Tutorial pharmacy. 6th Edition. New Delhi. CBS publications.
5. Rawlins, EA. (2008) Bentley's text book of Pharmaceutics. 8th Edition. English Language book Society.
6. Alfonso R Gennaro. (2012) Remington: The Science and Practice of Pharmacy, Vol- I and Vol–II. 22nd Edition. New Delhi: CBS Publishers.
7. Lachmann, Leon, Liebermann H. A. (2009) The Theory and Practice of Industrial Pharmacy.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1st Edition. New Delhi: CBS Publishers.
8. Roop K Khar. et al. (2013). Lachman / Liebermans: The Theory and Practice of Industrial Pharmacy. 4th Edition. New Delhi: CBS Publishers.

c.Recommended Readings

1. Bharath, S. (2012) Pharmaceutics- Formulations and Dispensing Pharmacy. 1st Edition. Asia: Pearson Publishers.
2. Bharath, S. (2012) Pharmaceutical Technology- Concepts and applications. 1st Edition. Asia: Pearson Publishers.
3. Government of India. (2007) Indian Pharmacopoeia. New Delhi: Government of India.
4. Government of India. (2010) Indian Pharmacopoeia. New Delhi: Government of India.
5. United States of Pharmacopoeial Convention. (2004) United States Pharmacopoeia. Rockville, MD: United States of Pharmacopoeial Convention.
6. Mitchell J Stoklosa and Howard C Ansel. (2012) Pharmaceutical Calculations. 14th Edition. US: Lippincott Williams and Wilkins.
7. Howard C Ansel. (2009) Pharmaceutical Calculations. 13th Edition. New Delhi: Lippincott Williams and Wilkins.

d.Magazines and Journals

1. International Journal of Pharmaceutical Sciences. Medknow Publications.
2. Indian Drugs, IDMA, Mumbai

e. Websites

1. www.americanpharmaceuticalreview.com
2. www.pharmamanufacturing.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Inorganic Chemistry (Theory)

Course Title	Pharmaceutical Inorganic Chemistry
Course Code	BPC104
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate students on the principles of limit test, monograph analysis of inorganic compounds/medicinal drugs and to prepare them for further study in the course discipline. The course deals with the chemistry involved in preparation, testing and estimation of inorganic pharmaceutical substances and formulations. It also deals with the study of radio-pharmaceuticals

2. Course Size and Credits:

Number of credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total hours of classroom interaction during the semester	60
Number of semester weeks	15
Department responsible	Pharmaceutical Chemistry
Course marks	**Total Mark: 100** **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: **75 Marks**
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the history and significance of pharmacopoeias and interpret monographs of inorganic drugs and pharmaceuticals
- **CO-2** Analyze sources and effects of impurities in inorganic pharmaceuticals and evaluate the principles and methodologies of limit tests
- **CO-3** Classify inorganic pharmaceuticals, explain their medicinal importance, and apply knowledge of electrolytes, buffers, and tonicity in pharmaceutical systems
- **CO-4** Apply methods of preparation, assay principles, properties, and medicinal uses of inorganic pharmaceuticals, and concepts of radiopharmaceuticals

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 **10 Hours**

Impurities in pharmaceutical substances: History of Pharmacopoeia, General Contents of monographs, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

General methods of preparation, assay for the compounds superscripted with **asterisk (*)**, properties and medicinal uses of inorganic compounds belonging to the following classes:

Unit 2 **10 Hours**

Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.

Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

Unit 3 **10 Hours**

Gastrointestinal agents

Acidifiers: Ammonium chloride* and Dil. Hydrochloric acid

Antacids: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

Topical Agents: Definition, properties of topical agents, classification of topical agents

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations

Unit 4 **08 Hours**

Miscellaneous compounds

Expectorants: Potassium iodide, Ammonium chloride*.

Emetics: Copper sulfate*, Sodium potassium tartrate

Haematinics: Ferrous sulphate*, Ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite

Astringents: Zinc Sulphate, Potash Alum

Unit 5 **07 Hours**

Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half-life, radio isotopes and study of radio isotopes - Sodium iodide I^{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2										3		3	
CO-3	3											3	
CO-4	3											3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1.Demonstration using Videos	3	
2.Demonstration using Physical Models/Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop/Course Workshop/Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry/Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of the course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2			X	X
CO-3			X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component-1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: The student is required to submit 1 word-processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination.

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities is limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class notes

b. **Essential Reading**

1. Atherdon, LM. (ed.) (1969) *Bentley and Drivers' Textbook of Pharmaceutical Chemistry* New Delhi: CBS Publishers in arrangement with Oxford University Press.
2. Ministry of Health and Family Welfare Govt. of India. (2014) *Indian Pharmacopoeia*. 7th edn, Ghaziabad: Indian Pharmacopoeia Commission
3. Block, JH, Roche EH, Soine TO and Wilson CO. (1986) *Inorganic Medicinal and Pharmaceutical Chemistry*. Bombay: Varghese Publishing in arrangement with Lee Febiger.

c. **Recommended Reading**

1. Lee, JD. (1996) *Concise Inorganic Chemistry* 5th edn. India: Wiley Eastern Ltd.
2. Loyd, VA Jr. (2013) *Remington. The Science and Practice of Pharmacy*. 22nd edn.UK: Pharmaceutical Press.
3. Cotton and Wilkinson. *Advanced Inorganic Chemistry*.18th edn. New Delhi: Wiley Eastern Ltd.
4. Svehla, G. *Vogel's Qualitative Inorganic Chemistry*. 7th edn. Prentice hall
5. Mendham, J. Denny, RC. Barnes, JD. Thomas, MJK. *Vogel's Text book of Quantitative Chemical Analysis*. 6th edn. (2008). New Delhi: Dorling Kindersley

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

(India) Pvt., Ltd, licensees of Pearson Education in South Asia.
6. Alexeyev, VN. (1994) *Qualitative Analysis*. New Delhi: CBS Publications.

d. Magazines and Journals

1. Indian Journal of Chemistry Section – A. Published by CSIR-NISCAIR

2. Indian Journal of Pharmaceutical Sciences. Scientific Publication of the Indian Pharmaceutical Association

e. Websites

1. http://www.chemseer.com/journals/journals_inorganic.shtml
2. http://www.web-formulas.com/
3. http://apps.who.int/phint/en/p/
4. www.ipc.gov.in

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Communication Skills Theory

Course Title	Communication Skills Theory
Course Code	BPC105
Course Type	Core Theory
Department	Directorate of Transferable Skills and Leadership Development
Faculty	Faculty of Pharmacy

1. Course Summary

This course aims at equipping students with the essentials of communication skills. The course equips students with knowledge pertaining to communication types and styles. It provides opportunities to practice interview skills and Group Discussion. It equips students with necessary skills to prepare for audience – centric presentations.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	2:0:0
Total Hours of Interaction	30
Number of Weeks in a Semester	15
Department Responsible	Directorate of Transferable Skills and Leadership Development
Total Course Marks	50
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the key terminologies of process of communication
- **CO-2.** Identify the importance of tone, body language and active listening as elements of effective communication and interpret the factors influencing communication perspectives
- **CO-3.** Explain the nuances of audience – centric presentation and demonstrate effective interview skills
- **CO-4.** Apply appropriate communication style in professional context

4. Course Contents

Unit 1 Communication Skills: Introduction, Definition, the Importance of Communication, the Communication
Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers,
Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers
Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences

Unit 2 Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Nonverbal communication), Verbal Communication, Physical Communication
Communication Styles: Introduction, The Communication Styles Matrix with example for each – Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

Unit 3 Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
Effective Written Communication: Introduction, When and When Not to Use Written Communication -
Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

Unit 4 Interview Skills: Purpose of an interview, Do's and Dont's of an interview
Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring your Presentation, Delivering Your Presentation, Techniques of Delivery.

Unit 5 Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1										3			2
CO-2								1	3	3			2
CO-3								1	2	3			2
CO-4										3			2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		25
Demonstrations		05
1. Demonstration using Videos	05	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		
1. Solving Numerical Problems	00	
Practical Work		10
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	10	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		04
Total Duration in Hours		**44**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2, SC3 or SC4), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1	X			X
CO-2	X			X
CO-3		X		X
CO-4		X		X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 35. Both components will be evaluated by the concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Classroom lectures, Self-study
3.	Critical Skills	Assignment
4.	Analytical Skills	Assignment
5.	Problem Solving Skills	Assignment, Examination
6.	Practical Skills	Assignment
7.	Group Work	--
8.	Self-Learning	Self-study
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	--
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

1. Class notes
2. Mukerjee, HS. (2013) *Business Communication*. UK: Oxford University Press.
3. Tyagi, K., Misra, P. (2011) *Professional Communication*. PHI: New Delhi.
4. Bovee, Courtland, L., Thills, John, V., Schatzman, Barbara E (2006) *Business Communication Today*.7th edn. Pearson education.
5. Kroehnert, Gary (2004) *Basic Presentation Skills*. Tata McGraw Hill.

b. Recommended Reading

1. Debashish, SS., and Das, B. (2014) *Business Communication*. New Delhi: PHI.
2. Funk, W. (2009) *Six Weeks to Words of Power*. New Delhi: W R Goyal Publishers
3. Lewis, N. (2014) *Word Power Made Easy*. New Delhi: W R Goyal Publishers.
4. Collins (2012) *Quick Cross Word*. UK: Puzzler Media.
5. Yule, G. (2008) *Oxford Practice Grammar*. New York: Oxford University Press.
6. Young, Dona,J. (2006) *Foundations of Business Communications: An Integrated Approach,*. Tata McGraw Hill.
7. Locker, Kitty, O., Kaczmarek, Kyo, S. (2007) *Business Communication: Building Critical Skills*. 3rd edn. Tata McGraw Hill.
8. Chaturvedi, P., Chaturvedi, D., Mukesh (2006) *Business Communication Concepts, Cases and Applications*. Pearson.
9. Lesikar, Raymond, V., Flatley, Marie, E., Rentz, Kathryn, Pande, Neerja (2002) *Business Communication: Making Connections in a Digital World*. 9th edn.Tata McGraw Hill.
10. Kaul, Asha (2007) *Effective Business Communication*. Prentice Hall India.
11. Bienvenu, Sherron (2008) *The Presentation Skills Workshop*. Prentice Hall.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

c. Magazines and Journals

1. Prabandhan: Indian Journal of Management. New Delhi
2. Journal of Marketing Management. UK: Westburn Publishers Limited
3. Business World. New Delhi: ABP group
4. Business Strategy

d. Websites

1. www.britishcouncil.com
2. www.englishmagazine.com
3. www.justenglishmagazine.com

e. Other Electronic Resources

https://ocw.mit.edu/index.htm

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean- Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Remedial Mathematics (Theory)

Course Title	Remedial Mathematics
Course Code	BPC106
Course Type	Core Theory
Department	Mathematical and Physical Sciences
Faculty	Pharmacy

1. Course Summary

The course introduces students to the basic concepts and techniques in functions, matrix algebra and analytical geometry. Students are taught the concepts of derivative, continuity, limits, functions and integral calculus. Mathematical operations in matrix theory, analytical geometry, differential equation and Laplace transforms are discussed in this course.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	2:0:0
Total Hours of Interaction	30
Number of Weeks in a Semester	15
Department Responsible	Mathematics
Total Course Marks	50
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1.** Explain the principles of matrix algebra, analytical geometry, differential and integral calculus, differential Equations and Laplace Transforms
- **CO-2.** Solve simple problems associated with functions, limit, continuity and partial fractions
- **CO-3.** Apply the appropriate standard form of matrix algebra and differential equation in solving problems in applications of pharmaceutical equations
- **CO-4.** Solve simple mathematical problems associated with matrix algebra, differential equations and Laplace transforms
- **CO-5.** Solve complex mathematical problems associated with matrix algebra, differential and integral calculus as well as Laplace Transforms

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

06 Hours

Partial fraction

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

Logarithms

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems

Function

Real Valued function, Classification of real valued functions

Limits and Continuity

Introduction, Limit of a function, Definition of limit of a function($\epsilon - \delta$ *definition*), $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \to 0} \frac{sin\theta}{\theta} = 1$

06 Hours

Matrices and Determinants:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-factors, Adjoint or Adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.

06 Hours

Calculus

Differentiation: Introductions, derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions(product formula), Derivative of the quotient of two function(Quotient formula) – Without Proof, Derivative of x^n w.r.t x, where n is ant rational number, Derivative of e^x, Derivative of $\log_e x$, Derivative of a^x, Derivative of Trigonometric functions from the first principles(without proof), Successive Differentiation, conditions for a function to be a maximum or a minimum at a point. Application **06 Hours**

Integration: Introduction, Definition, Standard formulae, Rules of Integration, Method of substitution, method of Partial fractions, integration by parts, definite integrals, application

Analytical Geometry: Introduction: Signs of the coordinates, Distance formula, Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line.

06 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S Ramaiah University of Applied Sciences
Bangalore-560054

Differential Equations: Some basic definitions, Order and degree, Equations in Separable form, Homogeneous Equations, Linear Differential Equations, Exact equations, Application in solving Pharmacokinetic equations

Laplace Transform: Introduction, Definition, properties of Laplace transform, Laplace Transforms of elementary function, Inverse Laplace transforms, Laplace transform of derivatives, Application in solving Chemical kinetics and Pharmacokinetics equations

06 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1													1		
CO-2	2	1											1	2		
CO-3			2	3									2	3		
CO-4		2	2										2			
CO-5			2	3									2	3		
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution																

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop / Course/Workshop / Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry / Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Written Examination		4
	Total Duration in Hours	**34**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Tech. (Electronics and Communication Engineering) Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2, SC3 or SC4), COs are assessed as illustrated in the following Table.

	Focus of COs on each Component or Subcomponent of Evaluation			
		Component 1:CE (30% Weightage)		Component 2:SEE (70% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Attendance	Assignment and interaction with students	Sessional Exam	35 Marks
Maximum Marks ▶	2	3	10	
CO-1		×		×
CO-2		×		×
CO-3		×		×
CO-4		×	×	×
CO-5			×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word-processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 1.5-hour duration Semester End Examination will be conducted for maximum marks of 35. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.
Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

1. Srinivasan.S (1990) Text Book of Mathematics, 2nd edition Mangalore: United Publishers.
2. Grewal.B. S (1993) Higher Engineering Mathematics, 29th edition Dehli: Khanna Publishers.
3. Rangi S S (2007) Mathematics for students of pharmacy, 1st edition Vikas and Company
4. Shanthinarayan. (1993) Differential Calculus, 13th edition New Dehli S Chand and Co.
5. Dr P K Sharma Remedial Mathematics 1st edition
6. Shanthinarayan. (1993) Integral Calculus, 13th edition New Dehli S Chand and Co.
7. Pharmaceutical Mathematics with application to Pharmacy by Panchaksarappa Gowda D.H

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

b. Recommended Reading

1. Kanpur J N (1991) Mathematical Statistics 15th edition New Dehli S chand and Co
2. Loney S L (1991) Plane Trigonometry Dehli A.I.T.B.S

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Remedial Biology (Theory)

Course Title	Remedial Biology Theory
Course Code	BPC107
Course Type	Core Theory
Department	Pharmacognosy/ Pharmacology
Faculty	Pharmacy

1.Course Summary

This aim of the course is to introduce students to the basic concepts in Biology. It imparts knowledge on the components of living world with special reference to human body. It focuses on the structure and functional systems of plant kingdom and humans. This course facilitates students to gain better understanding on Pharmacognosy and Pharmacology and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	2:0:0
Total Hours of Interaction	30
Number of Weeks in a Semester	15
Department Responsible	Pharmacology/Pharmacognosy
Total Course Marks	50 Component 1(CE): 15 Marks Part A: Continuous mode: 5Marks Part B: Sessional Exam: 10 Marks Component 2(SEE): Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Illustrate and explain the morphology, anatomy, and classification of plants along with cellular organization and diversity of living organisms.
- **CO-2** Explain the structure and functions of human body systems including circulatory, digestive, respiratory, excretory, nervous, endocrine, and reproductive systems
- **CO-3** Relate and analyze physiological processes in plants and humans, including nutrition, respiration, circulation, and coordination
- **CO-4** Classify and describe tissues, cell structure, and genetic organization, and explain the coordinated functioning of organs in maintaining homeostasis

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean / Academics
M.S. Ramaiah University of Applied Sciences

4. Course Contents

Living world:
a) Definition and characters of living organisms
b) Diversity in the living world
c) Binomial nomenclature
d) Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus
Morphology of Flowering plants:
a) Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
b) General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledons. **7 hours**

Body fluids and circulation
a) Composition of blood, blood groups, coagulation of blood
b) Composition and functions of lymph
c) Human circulatory system
d) Structure of human heart and blood vessels
e) Cardiac cycle, cardiac output and ECG

Digestion and Absorption
a) Human alimentary canal and digestive glands
b) Role of digestive enzymes
c) Digestion, absorption and assimilation of digested food

Breathing and respiration
a) Human respiratory system
b) Mechanism of breathing and its regulation
c) Exchange of gases, transport of gases and regulation of respiration
d) Respiratory volumes **7 hours**

Excretory products and their elimination
a) Modes of excretion
b) Human excretory system- structure and function Urine formation
c) Rennin angiotensin system

Neural control and coordination
a) Definition and classification of nervous system
b) Structure of a neuron
c) Generation and conduction of nerve impulse
d) Structure of brain and spinal cord
e) Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Chemical coordination and regulation
a) Endocrine glands and their secretions
b) Functions of hormones secreted by endocrine glands

Human reproduction
a) Parts of female reproductive system
b) Parts of male reproductive system
c) Spermatogenesis and Oogenesis

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

d) Menstrual cycle **7 hours**

Plants and mineral nutrition:
a) Essential mineral, macro and micronutrients
b) Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis
a) Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis. **5 hours**
Plant respiration: Respiration, glycolysis, fermentation (anaerobic).
Plant growth and development
a) Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators.
Cell - The unit of life:
a) Structure and functions of cell and cell organelles. Cell division.
Tissues
a) Definition, types of tissues, location and functions. **4 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3			2								3	
CO-2	3								2			3	
CO-3	3		2									3	
CO-4	3		2									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		00
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		4
Total Duration in Hours		**34**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1			X	X
CO-2			X	X
CO-3			X	X
CO-4			X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 1.5-hour duration Semester End Examination will be conducted for maximum marks of 35. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Dutta, A.C. (1992) Botany for degree students. 6th ed. Calcutta: Oxford University Press.
2. Marshall and Williams. (1992) Parker and Haswell Text book of Zoology. 7th edn. Delhi: CBS Publishers.
3. Ekambaranatha Ayyer, M and Ananthakrishnan, T.N. (1990) Outlines of Zoology. 12th ed. Madras: Viswanathan (Printers & Publishers) Pvt. Ltd.
4. Tortora Grabowski and Palmetto, G.A. Principles of Anatomy and Physiology, U.S.A.

c. Recommended Reading

Gokhale., S.B. and Kokate, C. K. (2007) A manual for pharmaceutical biology practical. Pune : Nirali Prakashan.

d. Magazines and Journals

1. International Journal of Anatomy and Physiology- IMED research publications, AP.
2. Journal of Anatomy-John Wiley & sons, New York, USA.

e. Websites

1. http://www.biologycorner.com
2. www.journals.elsevier.com/zoology

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Course Specifications: Human Anatomy and Physiology I Practical

Course Title	Human Anatomy and Physiology I Practical
Course Code	BPL108
Course Type	Core Practical
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of the course is to provide training on identification of tissues and bones and to interpret the laboratory findings to correlate with diseases. Students will be trained to dissect and also identify specific bones and tissues both macroscopically and microscopically. Students will also be trained to record vital signs and perform basic haematology and physiology experiments to correlate with various diseases.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	50 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Demonstrate the use of laboratory instruments and perform microscopic examination to identify various tissues and cellular components of the human body.

CO-2 Perform basic hematological experiments and interpret physiological parameters such as RBC count, bleeding time, and clotting time.

CO-3 Identify and explain the structure and functions of organ systems (skeletal, nervous, endocrine, and sensory systems) using specimens, models, and clinical examination techniques.

4. Course Contents

1. Study of compound microscope
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry
7. Enumeration of total red blood corpuscles (RBC) count
8. Determination of bleeding time
9. Determination of clotting time

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

10. Demonstration of total blood count by cell analyzer
11. To study the nervous system using specimen, models
12. To study the endocrine system using specimen, models
13. To demonstrate the general neurological examination
11. To demonstrate the function of olfactory nerve
12. To study the integumentary and special senses using specimen, models.

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3	2										3	
CO-2		3	2									3	
CO-3			3	2		2						3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		00
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
Attendance (refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35 and evaluated by concerned course leader and External examiner.

Reassessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Goyal, R. K., Natvar, M.P., Shah, S.A. (2008) Practical Anatomy, Physiology and Biochemistry, 11 th edn. Ahmedabad: B.S Shah Prakashan. 2. Ranade, V.G. (2009) Laboratory Manual and Journal of Physiology, 1 st edn. Pune: V. G. Paneerdas.

c. Recommended Reading

1. McNaught, A.B, Callander, R. (1987) Illustrated Physiology, 1st edn. New Delhi: B.I. Churchill Livingstone.
2. Phate, R.P. (2003) Anatomy, Physiology and Health Education, Nashik: Career Publication.
3. Bhai, P. Gandhi., Harit, R., Derasari. (2008) Elements of Human Anatomy, Physiology and Health Education, 17th edn. Ahmedabad: B.S. Shah Prakashan.
4. Abrahams P.H., Mark Jr S.C., Hutchings R.T. (2003) McMinn's Colour Atlas of Human Anatomy, 5th edn. Edinburgh: Elsevier.
5. Sri Nageswari, K., Sharma, R. (2006). Practical workbook of Human Physiology 1st edn. New Delhi: Jaypee Brothers Medical Publishers.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

d. Magazines and Journals

1. International Journal of Anatomy and Physiology. Nigeria: International Scholars
2. Journals Publishing Corporation 2. Journal of Anatomy. USA: Wiley

e. **Websites**

1. www.anatomycorner.com
2. www.anatomyzone.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Analysis Practical

Course Title	Pharmaceutical Analysis I Practical
Course Code	BPL109
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to train students in the calibration of apparatus used in pharmaceutical analysis. Students are also trained in performing different titrimetric methods for analysis of drugs and formulations and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	Total marks: 50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Demonstrate the preparation of primary and secondary standard solutions
CO-2 Determine the strength of secondary standard solutions using various titrimetric methods and electrochemical methods
CO-3 Assess the percentage purity of a given compound by titrimetric analysis

4. Course Contents

I Preparation and standardization of
(1) Sodium hydroxide
(2) Sulphuric acid
(3) Sodium thiosulfate
(4) Potassium permanganate
(5) Ceric ammonium sulphate

II Assay of the following compounds along with Standardization of Titrant
(1) Ammonium chloride by acid base titration
(2) Ferrous sulphate by Cerimetry

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

(3) Copper sulphate by Iodometry
(4) Calcium gluconate by complexometry
(5) Hydrogen peroxide by Permanganometry
(6) Sodium benzoate by non-aqueous titration
(7) Sodium Chloride by precipitation titration

III Determination of Normality by electro-analytical methods

(1) Conductometric titration of strong acid against strong base
(2) Conductometric titration of strong acid and weak acid against strong base
(3) Potentiometric titration of strong acid against strong base

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2			3					3				3	
CO-3			3					3					2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer		
Tutorials		
Practical Work		
1. Course Laboratory	60	60
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		72

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical record/viva voce	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

18. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. This will be evaluated by course leader and external examiner

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Mendham J, Denny RC, Barnes JD, Thomas MJK. Vogel's Text book of Quantitative Chemical Analysis. 6th Edition. (2008). New Delhi: Dorling Kindersley (India) Pvt., Ltd., Licensees of Pearson Education in South Asia.
2. Beckett, AH. Stenlake, JB. (2004) Practical Pharmaceutical Chemistry, Vol I. London. The Athlone Press of the University of London
3. Atherdon, LM. (ed.) (1969) Bentley and Drivers' Textbook of Pharmaceutical Chemistry. New Delhi: CBS Publishers in arrangement with Oxford University Press.

b. Reference Books

1. Loyd, VA Jr. (2013) Remington. The Science and Practice of Pharmacy. 22nd Edition. UK: Pharmaceutical Press.
2. Alexeyev, VN. (1994) Quantitative Analysis. New Delhi: CBS Publications.
3. India. Ministry of Health and Family Welfare Govt. of India. (2014) Indian Pharmacopoeia. 7th Edition. Ghaziabad: Indian Pharmacopoeia commission.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

c.Magazines and Journals

1. Indian Journal of Chemistry Section – B, New Delhi, National Institute of Science Communication and Information Resources, CSIR
2. Indian Journal of Pharmaceutical Sciences, Benaras, Indian Pharmaceutical Association
3. Asian Journal of Chemistry, Ghaziabad, Asian Publication Corporation

d.Websites

1. www.rsc.org
2. www.chemtube3d.com
3. http://www.chemseer.com/journals/journals_inorganic.shtml
4. http://www.web-formulas.com/
5. http://apps.who.int/phint/en/p/
6. www.ipc.gov.in

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutics-I Practical

Course Title	Pharmaceutics I Practical
Course Code	BPL110
Course Type	Core Practical
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to introduce techniques to prepare and dispense pharmaceutical dosage forms. Students will be able to select suitable packaging materials along with appropriate labelling conditions

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 15 Marks** 1A: Continuous Mode: 05 Marks 1B: Sessional Examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Select appropriate pharmaceutical dosage forms based on the physicochemical properties of drugs and excipients.
CO-2. Formulate and dispense liquid, semisolid, and bulk solid pharmaceutical preparations effectively
CO-3. Design pharmaceutical labels and critically evaluate formulations to identify and resolve instability issues, ensuring safety, efficacy, and regulatory compliance.

4. Course Contents

1. **Syrups**
   a) Syrup IP'66
   b) Compound syrup of Ferrous Phosphate BPC'68
2. **Elixirs**
   a) Piperazine citrate elixir
   b) Paracetamol pediatric elixir

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Linctus
a) Simple Linctus
b) Iodine Throat Paint (Mandl's Paint)

4. Solutions
a) Strong solution of ammonium acetate
b) Cresol with soap solution
c) Lugol's solution

5. Suspensions
a) Calamine lotion
b) Magnesium Hydroxide mixture
c) Aluminium Hydroxide gel

6. Emulsions
a) Turpentine Liniment
b) Liquid paraffin emulsion

7. Powders and Granules
a) ORS powder (WHO)
b) Effervescent granules
c) Dusting powder
d) Divided powders

8. Suppositories
a) Glycero-gelatin suppository
b) Cocoa butter suppository
c) Zinc Oxide suppository

8. Semisolids
a) Sulphur ointment
b) Non-staining iodine ointment with methyl salicylate
c) Carbopol gel

9. Gargles and Mouthwashes
a) Iodine gargle
b) Chlorhexidine mouthwash

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3									3	
CO-2			3									3	
CO-3								2					
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		10
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	10	
3. Demonstration on a Computer	00	
Numeracy		00
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1 and SC2), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical record/viva voce	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks
Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: **05 Marks**
1B: Sessional examination: **10 Marks**

1A: The marks allocated for Continuous mode of Internal Assessment shall be awardedas per the scheme given below.

Practical	
Attendance (Refer Table below)	2
Based on Practical Records, Regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional Examination
Two tests (each of 40 marks) of 4 hours' duration will be conducted, one at the end of 6 weeks and the other at the end of 12 weeks. The average of two tests reduced to 10 marks will be the marks scored in sessional exam.

Component - 2: 35marks

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

A 4 hour duration Semester End Examination will be conducted for maximum marks of 35 which will be evaluated by course leader and external examiner

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory work
10.	Verbal Communication Skills	Regular assessment and Viva Voice
11.	Presentation Skills	Laboratory work
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory work
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a.Essential Reading

1. Howard C Ansel, Lloyd Allen. (2013) Ansel's Pharmaceutical Dosage form and Drug delivery systems. 10th Edition. New Delhi: Lippincott Williams and Wilkins.
2. Carter, S J. (2008) Cooper and Gunn's-Dispensing for Pharmaceutical students. 12th Edition. New Delhi: CBS Publishers.
3. Aulton, ME. (2001) Pharmaceutics: The Science of Dosage Form Design. 2nd Edition. Edinburgh: Churchill Livingstone.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Carter, S J. (2005) Cooper and Gunn's-Tutorial pharmacy. 6th Edition. New Delhi. CBS publications.
5. Rawlins, EA. (2008) Bentley's text book of Pharmaceutics. 8th Edition. English Language book Society.
6. Alfonso R Gennaro. (2012) Remington: The Science and Practice of Pharmacy, Vol- I and Vol–II. 22nd Edition. New Delhi: CBS Publishers.
7. Lachmann, Leon, Liebermann H. A. (2009) The Theory and Practice of Industrial Pharmacy. 1st Edition. New Delhi: CBS Publishers.
8. Roop K Khar. et al. (2013). Lachman / Liebermans: The Theory and Practice of Industrial Pharmacy. 4th Edition. New Delhi: CBS Publishers.

b. Recommended Readings

1. Bharath, S. (2012) Pharmaceutics- Formulations and Dispensing Pharmacy. 1st Edition. Asia: Pearson Publishers.
2. Bharath, S. (2012) Pharmaceutical Technology- Concepts and applications. 1st Edition. Asia: Pearson Publishers.
3. Government of India. (2007) Indian Pharmacopoeia. New Delhi: Government of India.
4. Government of India. (2010) Indian Pharmacopoeia. New Delhi: Government of India.
5. United States of Pharmacopoeial Convention. (2004) United States Pharmacopoeia. Rockville, MD: United States of Pharmacopoeial Convention.
6. Mitchell J Stoklosa and Howard C Ansel. (2012) Pharmaceutical Calculations. 14th Edition. US: Lippincott Williams and Wilkins.
7. Howard C Ansel. (2009) Pharmaceutical Calculations. 13th Edition. New Delhi: Lippincott Williams and Wilkins.

c.Magazines and Journals

1. International Journal of Pharmaceutical Sciences. Medknow Publications.
2. Indian Drugs, IDMA, Mumbai

d. Websites

1. www.americanpharmaceuticalreview.com
2. www.pharmamanufacturing.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Inorganic Chemistry (Practical)

Course Title	Pharmaceutical Inorganic Chemistry Practical
Course Code	BPL111
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to train students in the preparation and performance of quality control tests for different inorganic compounds of pharmaceutical importance. The course emphasizes methods to perform limit tests for common impurities in pharmaceutical substances. The course also deals with methods of preparation and identification of inorganic pharmaceutical substances

2. Course Size and Credits:

Number of credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total hours of lab interaction during the semester	60
Number of tutorial hours	00
Number of semester weeks	15
Department responsible	Pharmaceutical Chemistry
Course marks	**Total Mark: 50** **Component 1(CE): 15 Marks** Part A: Continuous mode: 05 Marks Par B: Sessional Exam: 10 Marks **Component 2 (SEE):** Semester End Examination: **35 Marks**
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Perform limit tests and qualitative tests to identify and analyze impurities in inorganic pharmaceuticals
CO-2 Apply experimental procedures for the preparation of inorganic pharmaceuticals
CO-3 Identify inorganic compounds as per Indian Pharmacopoeia standards

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents: Suggested Practical

I Limit tests for following ions

- Limit test for Chlorides and Sulphates
- Modified limit test for Chlorides and Sulphates
- Limit test for Iron
- Limit test for Heavy metals
- Limit test for Lead
- Limit test for Arsenic

II Identification test

- Magnesium hydroxide
- Ferrous sulphate
- Sodium bicarbonate
- Calcium gluconate
- Copper sulphate

III Test for purity

- Swelling power of Bentonite
- Neutralizing capacity of aluminum hydroxide gel
- Determination of potassium iodate and iodine in potassium Iodide

IV Preparation of inorganic pharmaceuticals

- Boric acid
- Potash alum
- Ferrous sulphate

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3							3					3
CO-2	3							3					3
CO-3	3												
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		5
1. Demonstration using Videos	03	
2. Demonstration using Physical Models/Systems	02	
3. Demonstration on a Computer	00	
Practical Work		55
1. Course Laboratory	55	
2. Computer Laboratory	00	
3. Engineering Workshop/Course Workshop/Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry/Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of the course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30 % Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical Records, Regular viva voce	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks (CE)
Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

Practical	
Attendance (Refer Table below)	02
Based on Practical Records, Regular viva voce, etc.	03
Total	05

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Practical	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks (SEE)

A 4-hour duration Semester End Examination will be conducted for maximum marks of 35.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Component 2 will be evaluated by the course leader and external examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities is limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Course Notes

b. Essential Reading

1. Atherdon, LM. (ed.) (1969) *Bentley and Drivers' Textbook of Pharmaceutical Chemistry* New Delhi: CBS Publishers in arrangement with Oxford University Press.
2. Ministry of Health and Family Welfare Govt. of India. (2014) *Indian Pharmacopoeia*. 7th edn, Ghaziabad: Indian Pharmacopoeia Commission

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramaiah Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

c. Recommended Reading

1. Lee, JD. (1996) *Concise Inorganic Chemistry* 5th edn. India: Wiley Eastern Ltd.
2. Loyd, VA Jr. (2013) *Remington. The Science and Practice of Pharmacy*. 22nd edn.UK: Pharmaceutical Press.
3. Cotton and Wilkinson. *Advanced Inorganic Chemistry*.18thedn. New Delhi: Wiley Eastern Ltd.
4. Svehla, G. *Vogel's Qualitative Inorganic Chemistry*. 7thedn. Prentice hall
5. Mendham, J. Denny, RC. Barnes, JD. Thomas, MJK. *Vogel's Text book of Quantitative Chemical Analysis*. 6th edn. (2008). New Delhi: Dorling Kindersley (India) Pvt., Ltd, licensees of Pearson Education in South Asia.
6. Alexeyev, VN. (1994) *Qualitative Analysis*. New Delhi: CBS Publications.

d. Magazines and Journals

1.Indian Journal of Chemistry Section – A. Published by CSIR-NISCAIR

2.Indian Journal of Pharmaceutical Sciences. Scientific Publication of the Indian Pharmaceutical Association

e. Websites

1.http://www.chemseer.com/journals/journals_inorganic.shtml
2.http://www.web-formulas.com/
3.http://apps.who.int/phint/en/p/
4.www.ipc.gov.in

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Communication Skills (Practical)

Course Title	Communication Skills Practical
Course Code	BPL112
Course Type	Core Practical
Department	Directorate of Transferable Skills and leadership Development
Faculty	Faculty of Pharmacy

1. Course Summary

This course is designed to develop speaking skills and writing skills in students. It equips the Students with techniques required to enhance their oral presentation. The course gives practical exposure by using appropriate body language and tone. It focusses on comprehension of words by reading and listening and building of the word repertoire. Students are taught to recognize phonemes for proper articulation.

2. Course Size and Credits:

Number of Credits	01
Credit Structure (Lecture: Tutorial: Practical)	0:0:2
Total Hours of Interaction	30
Number of Weeks in a Semester	15
Department Responsible	Directorate of Transferable Skills and Leadership Development
Total Course Marks	25
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1.** Recognize phonemes for proper articulation of words
- **CO-2.** Explain the key concepts of writing skills and listening skills
- **CO-3.** Explain the key concepts of writing skills and listening skills
- **CO-4.** Demonstrate conversation skills using appropriate body language and tone
- **CO-5.** Demonstrate audience – centric presentation
- **CO-6.** Develop professional written document

4. Course Contents

Unit 1 Basic communication covering the following topics

Meeting People
Asking Questions
Making Friends
What did you do?
Do's and Dont's

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 2 Pronunciations covering the following topics
Pronunciation (Consonant Sounds)
Pronunciation and Nouns
Pronunciation (Vowel Sounds)

Unit 3 Advanced Learning
Listening Comprehension / Direct and Indirect Speech
Figures of Speech Effective Communication
Writing Skills
Effective Writing Interview
Handling Skills E-Mail etiquette
Presentation Skills

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1					1					2					
CO-2										2					
CO-3				1	1					2					1
CO-4									2	3				2	2
CO-5								1	2	3				2	2
CO-6								2	2	3					2

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		05
1. Demonstration using Videos	02	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		
1. Solving Numerical Problems	00	
Practical Work		10
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	28	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		2
Total Duration in Hours		**42**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Tech. (Electronics and Communication Engineering) Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2, SC3 or SC4), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 15 Marks**
Maximum Marks	**2**	**3**	**5**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
CO-5		X	X	X
CO-6		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks
Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Both components will be moderated by a second examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Classroom lectures, Self-study
3.	Critical Skills	Assignment
4.	Analytical Skills	Assignment
5.	Problem Solving Skills	Assignment, Examination
6.	Practical Skills	Assignment
7.	Group Work	--
8.	Self-Learning	Self-study
9.	Written Communication Skills	Assignment, Examination

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	--
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

1. Class notes
2. Mukerjee, HS. (2013) *Business Communication.* UK: Oxford University Press.
3. Tyagi, K., Misra, P. (2011) *Professional Communication.* PHI: New Delhi.
4. Bovee, Courtland, L., Thills, John, V., Schatzman, Barbara E (2006) *Business Communication Today.*7th edn. Pearson education.
5. Kroehnert, Gary (2004) *Basic Presentation Skills.* Tata McGraw Hill.

b. Recommended Reading

1. Debashish, SS., and Das, B. (2014) *Business Communication.* New Delhi: PHI.
2. Funk, W. (2009) *Six Weeks to Words of Power.* New Delhi: W R Goyal Publishers
3. Lewis, N. (2014) *Word Power Made Easy.* New Delhi: W R Goyal Publishers.
4. Collins (2012) *Quick Cross Word.* UK: Puzzler Media.
5. Yule, G. (2008) *Oxford Practice Grammar.* New York: Oxford University Press.
6. Young, Dona,J. (2006) *Foundations of Business Communications: An Integrated Approach,.* Tata McGraw Hill.
7. Locker, Kitty, O., Kaczmarek, Kyo, S. (2007) *Business Communication: Building Critical Skills.* 3rd edn. Tata McGraw Hill.
8. Chaturvedi, P., Chaturvedi, D., Mukesh (2006) *Business Communication Concepts, Cases and Applications.* Pearson.
9. Lesikar, Raymond, V., Flatley, Marie, E., Rentz, Kathryn, Pande, Neerja (2002) *Business Communication: Making Connections in a Digital World.* 9th edn.Tata McGraw Hill.
10. Kaul, Asha (2007) *Effective Business Communication.* Prentice Hall India
11. Bienvenu, Sherron (2008) *The Presentation Skills Workshop.* Prentice Hall.

c. Magazines and Journals

1. Prabandhan: Indian Journal of Management. New Delhi
2. Journal of Marketing Management. UK: Westburn Publishers Limited
3. Business World. New Delhi: ABP group
4. Business Strategy

d. Websites

1. www.britishcouncil.com
2. www.englishmagazine.com
3. www.justenglishmagazine.com

e. Other Electronic Resources

https://ocw.mit.edu/index.htm

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Remedial Biology (Practical)

Course Title	Remedial Biology Practical
Course Code	BPL113
Course Type	Core Practical
Department	Pharmacognosy/Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart practical training on identification of plant parts based on their macroscopic and microscopic characteristics and perform basic experiments in haematology and physiology. Students are also introduced to simulated experiments using computer models

2. Course Size and Credits:

Number of Credits	01
Credit Structure (Lecture: Tutorial: Practical)	0:0:2
Total Hours of Interaction	30
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy/Pharmacology
Total Course Marks	25 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 05 Marks **Component 2 (SEE):** Semester End Examination: 15 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Demonstrate fundamental biological laboratory techniques including microscopy, section cutting, staining, and identification of cells, tissues, and plant structures

CO-2 Analyze and identify structural organization in living organisms including frog systems (via models) and human skeletal components

CO-3 Perform and interpret basic physiological measurements and clinical tests such as blood grouping, blood pressure, and tidal volume

4. Course Contents

1. **Introduction to experiments in biology**

a) Study of Microscope

b) Section cutting techniques

c) Mounting and staining

d) Permanent slide preparation

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf and its modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3			2								3	
CO-2	2		2									3	
CO-3	3			2								3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		04
1.Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	04	
Tutorials		00
Practical Work		26
1. Course Laboratory	26	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Discussing Possible Innovations	00	
Laboratory Examination		06
Total Duration in Hours		**36**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component 1: CE (40% Weightage)			**Component 2: SEE (60% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 15 Marks**
Maximum Marks	**02**	**03**	**05**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks
Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Marks**
95 – 100	**2**
90 – 94	**1.5**
85 – 89	**1**
80 – 84	**0.5**
Less than 80	**0**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1B. Sessional exam: Two sessional exams (each for 20 marks) of 2 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 5 will be the marks scored in the Sessional Examination

Component - 2: 15 marks
A 2-hour duration Semester End Practical Examination will be conducted for maximum marks of 15.
Component 2 will be evaluated by course leader and external examiner.

Reassessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

Ramyanth K.V.
Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

9. Course Resources

a. Class Notes

b. EssentialReading

1. Goyal, R.K., Natvar M.P. and Shah S.A. (2008) Practical Anatomy, Physiology andBiochemistry. 11th ed. Ahmedabad: B.S Shah Prakashan
2. Kale, S.R and Kale R.R.(2015) Practical human anatomy and physiology. Pune: NiraliPrakashan
3. Gokhale, S.B., Kokate, C.K.and Shriwastava, S.P. A Manual of pharmaceutical biology practice
4. Shafi M.J.H. Biology practical manual according to National core curriculum. Biology forum of Karnataka

c. Recommended Reading

1. Dutta, A.C. (1992) Botany for degree students. 6th ed. Calcutta: Oxford University Press.

d. Magazines and Journals

1. Journal of Anatomy- John Wiley & sons, New York, USA.
2. International Journal of Anatomy and Physiology-IMED research publications, AP.

e. Websites

1. http://www.biologycorner.com
2. www.e-journals.org/botany
3. www.journals.elsevier.com/zoology

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 2

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Human Anatomy and Physiology – II Theory

Course Title	Human Anatomy and Physiology – II Theory
Course Code	BPC114
Course Type	Core Theory
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

This course is designed to impart fundamental knowledge on the structure and functions of the systems of the human body. The course facilitates students to learn about organ systems of the human body to gain better understanding on diseases, their treatment and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the homeostatic mechanisms with their imbalances and elaborate the coordinated working pattern of different organs of each system of human body
CO-2 Discuss the interlinked mechanisms involved in the maintenance of normal functioning of human body
CO-3 Appraise the gross morphology, structure and functions of organs of the human body
CO-4 Outline the structure of chromosomes, DNA and steps in protein synthesis

4. Course Contents

Unit 1. Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves Special senses: Structure and functions of eye, ear, nose and tongue and their disorders **10 hours**

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 2. Digestive system: Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT
Energetics: Formation and role of ATP, Creatinine Phosphate and BMR **06 hours**

Unit 3. Respiratory system: Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.
Urinary system: Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney. **10 hours**

Unit 4. Endocrine system: Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders. **10 hours**

Unit 5. Reproductive system: Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition
Introduction to genetics: Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance **09 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		2									3	
CO-2			2						2			3	
CO-3	3											3	
CO-4	3			2								3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Sembulingam, K., Sembulingam, P. (2016) Essentials of Medical Physiology 7th edn. New Delhi: Jaypee Brothers Medical Publishers.
2. Kathleen, J. W. W. (1996) Anatomy and Physiology in Health and Illness. New York: Churchill Livingstone.
3. Tortora Grabowski. (1992) Principles of Anatomy and Physiology 7th edn. New York: Harper and Collins.
4. Vasudeva, N., Mishra, S. (ed.) (2016) Inderbir Singh's Text book of Human Histology 8th edn. New Delhi: Jaypee Brother's Medical Publishers.
5. Ghai, C. L. (2012) Text book of Practical Physiology 8th edn. New Delhi: Jaypee Brother's Medical Publishers.

c. Recommended Reading

1. Tandon, O. P., Tripathi, Y. (ed.)(2011) Best and Taylor's Physiological Basis of Medical Practice 13th edn. Riverview, Mi, USA: Lippincott Williams & Wilkins Co.
2. Guyton, A. C., John, E. H. (2012) Text book of Medical Physiology 11th edn. Miamisburg, U.S.A: Elsevier.
3. Chatterjee, C. C. (2016) Human Physiology (Vol 1 and 2) 11th edn. Kolkata: Academic Publishers.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

d. Magazines and Journals

1. Indian Journal of Clinical Anatomy and Physiology
2. International Journal of Anatomy & Applied Physiology

e. Websites

1. www.anatomycorner.com
2. www.anatomyzone.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Organic Chemistry I Theory

Course Title	Pharmaceutical Organic Chemistry I Theory
Course Code	BPC115
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

This course deals with the classification and nomenclature of simple organic compounds. The course contents deal with structural isomerism, intermediates formed in reactions, important properties, reactions, methods of preparation of organic compounds. This course also emphasizes mechanisms and orientation of reactions.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Explain the nomenclature, structure, and isomerism of organic compounds
CO-2. Summarize general reactions and discuss the mechanisms involved in organic reactions
CO-3. Analyze the reactivity, orientation, and stability of organic compounds
CO-4. Identify the properties and uses of important organic compounds

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1

Classification, nomenclature and isomerism:

Classification of Organic Compounds. Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds) Structural isomerisms in organic compounds

07 hours

Unit 2

Alkanes, Alkenes and Conjugated dienes:

SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP^2 hybridization in alkenes

E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidence. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

10 hours

Unit 3

Alkyl halides

SN^1 and SN^2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

SN^1 versus SN^2 reactions, Factors affecting SN^1 and SN^2 reactions Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and Iodoform.

Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

10 hours

Unit 4

Carbonyl compounds (Aldehydes and ketones)

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanillin, Cinnamaldehyde.

10 hours

Unit 5

Carboxylic acids

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

Aliphatic amines

Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

08 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											2	
CO-2	3											3	1
CO-3	2											1	1
CO-4	3											1	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Morrison, R.T. and Boyd, R.N. (2008) Organic Chemistry, 6th Edition,New Jersey: Prentice Hall Pvt Ltd.
2. Graham Solomons, T.W. (1996) Organic Chemistry. 6th Edition. USA: John Wiley &Sons,Inc.
3. Vogel, A.I. and Furniss, B.S. (1989) Textbook of Practical Organic Chemistry, 4th Edition,London: ELBS Longman

c. Recommended Reading

1. Finar, I.L. (1990) Organic Chemistry – The Fundamental Principles, 6th Edition, London:ELBS Publishers.
2. March, J. (1992) Advanced Organic Chemistry,4th Edition,Singapore: Wiley Inter science publication.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Bentely, A.O., and Driver,J.E.(1995) Bentley and Driver's Textbook of Pharmaceutical Chemistry,8thEdition, New Delhi: Oxford University Press.
4. Mann, F.G. and Saunders, BC.(1986) Practical Organic Chemistry. 4th Edition., NewmDelhi: Orient Longman Limited.
5. Soni P.L.(1985) Text book of organic chemistry –A Modern approach. Sultan Chand and Sons
6. Indian Pharmacopoeia. Govt. of India, Ministry of Health and Family welfare. Latest Edition.
7. Ahluwaliah, V.K (2009) Organic reaction mechanism,Ane.New Delhi: Books Pvt Ltd.
8. Bahl,.B.S. and Bahl, A. (2000).Advanced Organic Chemistry ,New Delhi: S.Chand and company Ltd.

d. Magazines and Journals

1. Indian Journal of Chemistry Section – B. NISCAIR PUBLICATIONS
2. European Journal of Medicinal Chemistry. Published under the auspices of the French Société de Chimie Thérapeutique (SCT) www.sciencedirect.com
3. Indian Journal of Pharmaceutical Sciences. Scientific Publication of the Indian Pharmaceutical Association

e. Websites

1. www.rsc.org
2. www.newdruginfo.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Biochemistry (Theory)

Course Title	Biochemistry Theory
Course Code	BPC116
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate students on the principles and chemical processes of primary metabolic pathways of nutrient molecules in physiological and pathological conditions. Biochemistry deals with the molecular levels of the chemical processes associated with living cells. The course provides biochemical facts and the principles of metabolism of nutrient molecules in physiological and pathological conditions. It also emphasizes genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the structure, classification and functions of major biomolecules
- **CO-2** Discuss enzymes, enzyme kinetics and their role in biochemical reactions
- **CO-3** Illustrate the concept of bioenergetics and biological oxidation along with metabolic pathways of carbohydrate, lipids, proteins and nucleotides
- **CO-4** Explain the metabolic changes in diseases and clinical conditions

4. Course Contents

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 1 (Biomolecules): Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

Bioenergetics:
Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.
Energy rich compounds; classification; biological significances of ATP.

08 hours

Unit 2 (Carbohydrate metabolism):
Glycolysis – Pathway, energetics and significance, Citric acid cycle- Pathway, energetics and significance, HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency, Glycogen metabolism Pathways and glycogen storage diseases (GSD), Gluconeogenesis - Pathway and its significance, Hormonal regulation of blood glucose level and Diabetes mellitus.

Biological oxidation:
Electron transport chain (ETC) and its mechanism, Oxidative phosphorylation & its mechanism and substrate level phosphorylation, Inhibitors of ETC and oxidative phosphorylation/ Uncouplers.

10 hours

Unit 3 (Lipid metabolism):
β- Oxidation of saturated fatty acid (Palmitic acid), Formation and utilization of ketone bodies; ketoacidosis, De novo synthesis of fatty acids (Palmitic acid), Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D, Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Amino acid metabolism:
General reactions of amino acid metabolism: Transamination, deamination &decarboxylation, urea cycle and its disorders, Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alkeptonuria, tyrosinemia), Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline. Catabolism of heme; hyperbilirubinemia and jaundice.

08 hours

Unit 4 (Nucleic acid metabolism and genetic information transfer):
Biosynthesis of purine and pyrimidine nucleotides, Catabolism of purine nucleotides and Hyperuricemia and Gout disease, Organization of mammalian genome, Structure of DNA and RNA and their functions, DNA replication (semi conservative model), Transcription or RNA synthesis, Genetic code, Translation or Protein synthesis and inhibitors

10 hours

Unit 5 (Enzymes):
Introduction, properties, nomenclature and IUB classification of enzymes, Enzyme kinetics
(Michaelis plot, Line Weaver Burke plot), Enzyme inhibitors with examples, Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation, Therapeutic and diagnostic applications of enzymes and isoenzymes, Coenzymes –Structure and biochemical functions studies.

10 hours

5. Course Map (CO-PO-PSO Map)

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											1	
CO-2	3										2	3	
CO-3	3		2								2	3	
CO-4			2								2	2	1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		x	x	x
CO-2			x	x
CO-3			x	x
CO-4			x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Satyanarayana, U. and Chakrapani, U. (2013) Biochemistry 4th edn. Kolkata: Books and Allied (P) Ltd.
2. Rama Rao, A.V. S. S. (2008) Textbook of Biochemistry 10th edn. New Delhi: UBS Publishers Distributors Pvt Ltd.
3. Deb, A. C. (2008) Fundamentals of Biochemistry 9th edn. Kolkata: New Central Book Agency (P) Ltd.

c. Recommended Reading

1. Nelson, D. L., Lehninger, A. L. and Cox, M. M. (2008) Principles of Biochemistry 5th edn. New Delhi: CBS Publishers
2. Murray, R. K., Botham, Peter, J, Kennelly and Victor Rodwell, P. (2012) Harper's Biochemistry 29th

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

edn.Canada: McGraw-Hill Education
3. Berg, J. M. Tymoczko, J. L. and Stryer, L. (2002) Biochemistry 5th edn. New York: W. H. Freeman and Co.

e. Magazines and Journals

1. Biochemistry Research International, New York: Hindawi Publishing Corporation
2. Biochemistry and Analytical Biochemistry, Los Angeles: Omics International
3. The Journal of Nutritional Biochemistry, Amsterdam: Elsevier

e. **Websites**

1. http://www.bioch.ox.ac.uk
2. http://www.biochemistry.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pathophysiology Theory

Course Title	Pathophysiology Theory
Course Code	BPC117
Course Type	Core Theory
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate students on the pathophysiological mechanisms of disease conditions. The course facilitates students to get the baseline knowledge required for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Describe the basic principles of cell injury and adaptation, including the mechanisms of inflammation, repair, and the process of cell death (apoptosis and necrosis)

CO-2 Explain the etiology and pathogenesis of common cardiovascular, respiratory, and renal disorders such as hypertension, asthma, and acute/chronic renal failure.

CO-3 Analyze the underlying mechanisms of endocrine, gastrointestinal, and bone disorders, focusing on hormonal imbalances, peptic ulcers, and rheumatoid arthritis.

CO-4 Discuss the pathophysiology of infectious diseases, malignancy, and hematological disorders, specifically focusing on the progression of AIDS, cancer, and various types of anemia.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1. Basic Principles of Cell Injury and Adaptation:
Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Morphology of cell injury and intra cellular accumulation.
Basic Mechanisms involved in the process of inflammation and repair: Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation –Vascular and Cellular events, Mediators of inflammation, Basic principles of wound healing in the skin.

12 hours

Unit 2. Cardiovascular System: Etiopathogenesis of Hypertension, congestive heart failure, angina pectoris, myocardial infarction, atherosclerosis and arteriosclerosis
Hematological Diseases: Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), hereditary acquired anemia-sickle cell anemia, thalassemia, hemophilia
Respiratory system: Asthma, Chronic obstructive airways diseases
Renal system: Acute and chronic renal failure

10 hours

Unit 3. Endocrine system: Diabetes, Goiter, PCOD and erectile dysfunction
Nervous system: Epilepsy and stroke
Neurodegenerative disorder: Alzheimer's disease and Parkinson's disease
Psychiatric disorders: Depression and schizophrenia

08 hours

Unit 4. Gastrointestinal system and Liver: Peptic Ulcer, Inflammatory bowel diseases, jaundice, hepatitis A and B, alcoholic liver disease.
Diseases of bones and joints: Rheumatoid arthritis and gout
Principles of cancer: Classification, characteristics and pathogenesis of cancer

10 hours

Unit 5. Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis
Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea

05 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2			2									3	
CO-3						2					2	3	2
CO-4	3											3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

a. Kumar, V., Abbas, A.K. and Fausto, N. (ed.) (2011) Robbins and Cotran Pathologic Basis of Disease. 8th edn. Philadelphia: W.B. Saunders.
b. Harsh, M. (2010) Text Book of Pathophysiology. 6th edn. Chennai: Jaypee Publishers.
c. Bhinde, Y.M., Deodhare, S.G. and Kelkar, S.S (1994) Text Book of Pathology, Bombay: Popular Prakashan.
d. Walker, R. (2009) Clinical Pharmacy and Therapeutics. 2nd edn. London: Churchill Livingstone.

c. Recommended Reading

a. Elizabeth Corwin, J. (1996) Handbook of Pathophysiology. 4th edn. Philadelphia: Lippincott Williams and Wilkins.
b. Carol, P. (2005) Pathophysiology: Concepts of Altered Health States. 2nd edn. Philadelphia: Lippincott Williams and Wilkins.

d. Magazines and Journals

a. Indian Journal of Pharmacology. Mumbai: Wolters Kluwer - Medknow Publications.
b. Journal of Pharmacy and Pharmacology. UK: Royal Pharmaceutical Society.
c.Indian Journal of Pharmaceutical Sciences. Mumbai: Medknow Publications.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

e. **Websites**

http://www.mednotes.net

f. **Other electronics Resources**

a. Kathryn I. Mccance, RN, and Sue E. Huether, Pathophysiology Online for Pathophysiology, 6th Edition, The biologic Basis for Disease in Adults and Children, College of Nursing University of Utah, Salt Lake City, UT.

b. Esther Chang, John Daly, Doug Elliot (2006) Pathophysiology Applied to Nursing Practice, Australia: Elsevier.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Computer Applications in Pharmacy Theory

Course Title	Computer Applications in Pharmacy Theory
Course Code	BPC118
Course Type	Core Theory
Department	Computer Science and Engineering
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate the students the basics in computer applications and to prepare them for further study in the course discipline. This course facilitates students acquire knowledge on the creation and analysis of data bases and applications of computers in the pharmaceutical field.

2. Course Size and Credits:

Number of Credits	03
Credit Structure (Lecture: Tutorial: Practical)	3:0:0
Total Hours of Interaction	45
Number of Weeks in a Semester	15
Department Responsible	Computer Science and Engineering
Total Course Marks	75 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 50 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1. Outline the applications of computer in Pharmacy
CO-2. Summarize bioinformatics and their impact in vaccine discovery
CO-3. Analyze the different types of databases
CO-4. Develop data bases using MS Access, SQL
CO-5. Formulate the role of computers for data analysis in the field of preclinical development

4. Course Contents

Unit 1. Number system

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division

Concept of Information Systems and Software

Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

06 hours

Unit 2. Web technologies

Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

06 hours

Unit 3. Application of computers in Pharmacy

Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

06 hours

Unit 4. Bioinformatics

Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

06 hours

Unit 5. Computers as data analysis in Preclinical development

Chromatographic dada analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS)

06 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	-	-	-	-	1	-	1	1	-	2	3	-	-	3
CO-2	3	-	-	-	-	1	-	1	1	-	2	3	-	-	3
CO-3	3	-	-	-	-	1	-	1	1	-	2	3	-	-	3
CO-4	3	-	-	-	-	1	-	1	1	-	2	3	-	-	3
CO-5	3	-	-	-	-	1	-	1	1	-	2	3	-	-	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		35
Demonstrations		10
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	10	
Tutorials		
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		4
Total Duration in Hours		**49**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramanath K.V.
Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (33% Weightage)			Component 2: SEE (67% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 50 Marks
Maximum Marks	4	6	15	
CO-1			x	x
CO-2			x	x
CO-3			x	x
CO-4		x	x	x
CO-5		x	x	x
The details of SC1, SC2, and SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 50 marks

A 2-hour duration Semester End Examination will be conducted for maximum marks of 50. Both components will be evaluated by the concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class Notes**
b. **Essential Reading**

1. Fassett, W.E., (1986) Computer Application in Pharmacy. Lea and Febiger: USA.
2. Ekins. S., Computer Application in Pharmaceutical Research and Development. USA: Willey and Sons, INC.
3. Rastogi, S.C., Bioinformatics (Concept, Skills and Applications). New Delhi: CBS Publishers.
4. Prague, C. N., (2003) Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath. New Delhi: Wiley Dreamtech India (P) Ltd.

c. **Recommended Reading**

1. Alterrovitz, G and Ramani, M.R., (2007) Systems Bioinformatics: An Engineering Case-Based Approach. Artech House Inc.
2. Li. W and Banks. K., Computers as Data Analysis and Data Management Tools in Preclinical Development.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Henderson, K., the Guru's Guide to SQL Server Stored Procedures, XML, and HTML.

d. Websites

1. W3Schools – "SQL Tutorial" www.w3schools.com
2. www.codeacademy.com
3. www.SQLZoo.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Environmental Sciences (Theory)

Course Title	Environmental Sciences Theory
Course Code	BPC119
Course Type	Core Theory
Department	Pharmaceutics/ Pharmacology
Faculty	Pharmacy

1. Course Summary

This course deals with the essential aspects of environmental sciences. This course facilitates students to appreciate the need for public awareness in pollution control. The course emphasizes social issues associated with the environment and their impact on human health.

2. Course Size and Credits:

Number of Credits	03
Credit Structure (Lecture: Tutorial: Practical)	3:0:0
Total Hours of Interaction	45
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	75 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 50 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1	Outline and understand natural resources and ecosystems
CO-2	Develop awareness and interest in environmental improvement
CO-3	Analyze environmental pollution and its impact
CO-4	Formulate measures to identify and solve environmental issues

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1. The Multidisciplinary nature of environmental studies
a. Natural Resources
b. Renewable and non-renewable resources: Natural resources and associated problems
I. Forest resources
II. Water resources
III. Mineral resources
IV. Food resources
V. Energy resources
VI. Land resources
c. Role of an individual in conservation of natural resources.

10 hours

Unit 2. Ecosystems
a. Concept of an ecosystem
b. Structure and function of an ecosystem.
c. Introduction, types, characteristic features, structure and function of the ecosystems:
I. Forest ecosystem
II. Grassland ecosystem
III. Desert ecosystem
IV. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

10 hours

Unit 3. Environmental Pollution: Air pollution; Water pollution; Soil pollution

10 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2		3										3	
CO-3			3			2						3	
CO-4				2							1		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		4
Total Duration in Hours		**49**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (33% Weightage)			Component 2: SEE (67% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 50 Marks
Maximum Marks	4	6	15	
CO-1			×	×
CO-2			×	×
CO-3			×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and Interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 50 marks

A 2-hour duration Semester End Examination will be conducted for maximum marks of 50. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class Notes**

b. **Essential Reading**

Bharucha, E. (2004) Environmental Studies. New Delhi: University Grants Commission

c. **Recommended Reading**

a. Sing, Y.K. (2006) Environmental Science. Bangalore: New Age International Pvt, Publishers.
b. Agarwal, K.C. (2001) Environmental Biology. Bikaner: Nidi Publishers Ltd.
c.Erach, B. (2008) The Biodiversity of India. Ahmedabad: Mapin Publishing Pvt. Ltd.
d. Brunner R.C. (1989) Hazardous Waste Incineration. New York: McGraw Hill Inc.
e. Clark R.S. (2001) Marine Pollution. Clanderson Press Oxford
f. Cunningham, W.P., Cooper, T.H., Gorhani, E and Hepworth, M.T. (2001) *Environmental Encyclopedia*. Mumbai: Jaico Publishing House.
g. De, A.K. (1990) Environmental Chemistry. New Delhi: Wiley Eastern Ltd.
h. Down of Earth, Centre for Science and Environment (R)

d. **Magazines and Journals**

a. The Green Guide. US: Natural Geographic Society

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

b. Sanctuary Asia. India: Sanctuary Features
c.Xover. India: BCIL Alt
d. Indian Journal of Environmental Protection. India: Scientific Publishers.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Human Anatomy and Physiology – II (Practical)

Course Title	Human Anatomy and Physiology – II Practical
Course Code	BPL120
Course Type	Core Practical
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

Practical training allows the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	50 **Component 1:** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Identify the tissues, organs of human body and elaborate the coordinated working pattern of different organs of each system of human body

CO-2 Demonstrate and evaluate basic physiological functions including sensory responses, reflex activity, thermoregulation, respiratory parameters, and cardiovascular measurements

CO-3 Perform and interpret clinical and laboratory investigations such as blood analysis (WBC count, hemoglobin estimation, blood grouping, ESR) and vital parameter recordings (BP, pulse rate, BMI).

4. Course Contents

1. To examine the different types of taste
2. To demonstrate the visual acuity
3. To demonstrate the reflex activity
4. Recording of body temperature
5. To demonstrate positive and negative feedback mechanism.

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560 054

6. Determination of tidal volume and vital capacity
7. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive
8. systems with the help of models, charts and specimens
9. Recording of basal mass index
10. Study of family planning devices and pregnancy diagnosis test
11. Permanent slides of vital organs and gonads
12. Enumeration of white blood cell (WBC) count
13. Estimation of hemoglobin content
14. Determination of blood group
15. Determination of erythrocyte sedimentation rate (ESR)
16. Determination of heart rate and pulse rate
17. Recording of blood pressure

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3			2								3	
CO-2	3		2									3	
CO-3	3								2			3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		00
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Less than 80	0

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4 hour duration Semester End Practical Examination will be conducted for maximum marks of 35 and evaluated by concerned course leader and External examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9. Course Resources

a. Class Notes

b. Essential Reading

a. Goyal, R. K., Natvar, M.P., Shah, S.A. (2008) Practical Anatomy, Physiology and Biochemistry, 11th edn. Ahmedabad: B.S Shah Prakashan.

b. Ranade, V.G. (2009) Laboratory Manual and Journal of Physiology, 1st edn. Pune: V. G. Paneerdas.

c. Recommended Reading

1. McNaught, A.B, Callander, R. (1987) Illustrated Physiology, 1st edn. New Delhi: B.I. Churchill Livingstone.
2. Phate, R.P. (2003) Anatomy, Physiology and Health Education, Nashik: Career Publication.
3. Bhai, P. Gandhi., Harit, R., Derasari. (2008) Elements of Human Anatomy, Physiology and Health Education, 17th edn. Ahmedabad: B.S. Shah Prakashan.
4. Abrahams P.H., Mark Jr S.C., Hutchings R.T. (2003) McMinn's Colour Atlas of Human Anatomy, 5th edn. Edinburgh: Elsevier.
5. Sri Nageswari, K., Sharma, R. (2006). Practical workbook of Human Physiology 1st edn. New Delhi: Jaypee Brothers Medical Publishers.

d. Magazines and Journals

a. International Journal of Anatomy and Physiology.

b. Journal of Anatomy

e. Websites

1. www.anatomycorner.com
2. www.anatomyzone.com

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Organic Chemistry I Practical

Course Title	Pharmaceutical Organic Chemistry I Practical
Course Code	BPL121
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. **Course Summary**

The aim of this course is to train students in the fundamental practical aspects of organic chemistry. This course emphasizes on systematic qualitative analysis leading to the identification of different classes of organic compounds.

2. **Course Size and Credits:**

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional Exam: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. **Course Outcomes (COs)**

After the successful completion of this course, the student will be able to:

CO-1 Analyze organic compounds by systematic qualitative analysis
CO-2 Determine the boiling point/ melting point of organic compounds
CO-3 Demonstrate preparation of solid derivatives & molecular model sets

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences

4. Course Contents

I. Identification of organic compounds belonging to the following classes by systematic qualitative organic analysis and determination of boiling point/melting point of organic compound

Minimum 5 unknown organic compounds to be analysed systematically

1. Polyhydric phenols
2. Amides/urea
3. Carbohydrates
4. Amines
5. Carboxylic acids
6. Aldehydes
7. Ketones
8. Alcohols
9. Esters
10. Aromatic and halogenated Hydrocarbons
11. Anilides
12. Nitro compounds

46 hours

II. Preparation of suitable solid derivatives from organic compounds

08 hours

III. Construction of molecular models

06 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		2					1				3	
CO-2	2											2	
CO-3			2									1	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		03
1.Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	03	
3. Demonstration on a Computer		
Numeracy		
1. Solving numerical problems		00
Practical Work		57
1. Course Laboratory	57	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component(CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical record /Viva voce	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
Attendance (refer table below)	2
Based on practical records, regular viva voce etc	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4 hour duration Semester End Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Re-assessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Vogel, A.I. and Furniss, BS. (1989)*Textbook of Practical Organic Chemistry*. 4th Edition.
2. Pavia, D.L. Lampman, GM. Kriz, GS. and Engel, RG.(1990).*Introduction to Laboratory Techniques*.3rd Edition. USA: Saunders College Publishers
3. Ministry of Health and Family Welfare Govt. of India. (2018) *Indian Pharmacopoeia*. 8th Edition. Ghaziabad: Indian Pharmacopoeia Commission

b. Recommended Reading

1. Mann, F.G. and Saunders, BC.(1986) *Practical Organic Chemistry*. 4th Edition., New Delhi: Orient Longman Limited
2. Vogel, A.I. (2004) *Elementary Practical Organic Chemistry*. 2nd Edition.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

London: ELBS Longman.

3. Vishnoi N. K. *Advanced Practical Organic Chemistry* 3rd edition. Vikas Publishing

c. Magazines and Journals

Indian Journal of Pharmaceutical Sciences, Indian Pharmaceutical Association Mumbai, India.

d. Websites

a. www.cimsasia.com/india
b. www.organic-chemistry.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Biochemistry (Practical)

Course Title	Biochemistry Practical
Course Code	BPL122
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart training to the students on analysis of primary and secondary metabolites, to provide the basis for diagnosis of diseases and to prepare them for further study in the course discipline. It deals with the identification and estimation of biochemical constituents.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	Total marks: 50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Identify normal and abnormal biochemical constituents of urine
- **CO-2** Identify and determine carbohydrates and proteins by qualitative and quantitative analysis
- **CO-3** Estimate biochemical parameters in blood and urine

4. Course Contents

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			2					1				2	
CO-2			3					2				3	
CO-3			3					2				3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer		
Tutorials		
Practical Work		60
1. Course Laboratory	60	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Laboratory Examination	12	12

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Total Duration in Hours	**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Marks**
95 – 100	**2**
90 – 94	**1.5**
85 – 89	**1**
80 – 84	**0.5**
Less than 80	**0**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

18. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks
A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Reassessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. Satyanarayana, U. and Chakrapani, U. (2013) Biochemistry 4th edn. Kolkata: Books and Allied (P) Ltd.
2. Deb, A. C. (2008) Fundamentals of Biochemistry 9th edn. Kolkata: New Central Book Agency (P) Ltd.
3. Plummer, D. T. (2009) Introduction of Practical Biochemistry 3rd edn. New Delhi: Tata McGraw-Hill Education.
4. Malhotra, V.K. (2003) Practical Biochemistry for Students 4th edn. New Delhi: Jaypee Publisher.
5. Sawhney, S.K. and Singh,R. (2014) Introductory Practical Biochemistry 5th edn. New Delhi: Narosa Publishing House.

b. Reference Books

1. Nelson, D. L., Lehninger, A. L. and Cox, M. M. (2008) Principles of Biochemistry 5th edn. New Delhi: CBS Publishers.
2. Murray, R. K., Botham, Peter, J, Kennelly and Victor Rodwell, P. (2012) Harper's Biochemistry 29th edn. Canada: McGraw-Hill Education.
3. Varley, H. (2006) Practical Clinical Biochemistry 6th edn. New Delhi: CBS Publishers.

c. Magazines and Journals

1. Biochemistry Research International, New York: Hindawi Publishing Corporation.
2. Biochemistry and Analytical Biochemistry, Los Angeles: Omics International.
3. The Journal of Nutritional Biochemistry, Amsterdam: Elsevier.

d. Websites

1. http://www.bioch.ox.ac.uk
2. http://www.biochemistry.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Computer Applications in Pharmacy (Practical)

Course Title	Computer Applications in Pharmacy Practical
Course Code	BPL123
Course Type	Core Practical
Department	Management and Commerce
Faculty	Pharmacy

1. Course Summary

The course aims to train the students with practical aspects of computer applications in pharmacy through a series of experiments.

2. Course Size and Credits:

Number of Credits	01
Credit Structure (Lecture: Tutorial: Practical)	0:0:2
Total Hours of Interaction	30
Number of Weeks in semester	15
Department Responsible	Computer Science and Engineering
Total Course Marks	Total Marks: 25 **Component 1: 10 Marks** CE1A: Record Assessment: 05 Marks CE1B: Sessional Exam: 05 Marks **Component 2 (SEE): 15 Marks** Semester End Examination: 15 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Create pharmaceutical documents, questionnaires, and reports using MS Word
CO-2 Develop and manage databases using MS Access, including tables, queries, and reports
CO-3 Apply web technologies (HTML/XML) and integrate database tools for data export and presentation

4. Course Contents

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools
4. Creating mailing labels Using Label Wizard, generating label in MS WORD
5. Create a database in MS Access to store the patient information with the required fields using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

database

7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	2		1	2				3			1	2	
CO-2	2		3	3				1			2	3	
CO-3	2		2	3				2			2	2	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Tutorials		
Practical Work		30
1. Course Laboratory	30	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit/ Hospital Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	05	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Discussing Possible Innovations	00	
Written Examination		02
Total Duration in Hours		**32**

7. Course Assessment and Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to re-sit for examination (Supplementary examination).
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall reregister during summer semester to meet the attendance requirements.
3. The maximum number of such opportunities are limited and as per the Academic regulations governing this programme.

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (40% Weightage)			**Component 2: SEE (60% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Record**	**Sessional Exam**	**Semester End Examination**
Maximum Marks	**02**	**03**	**05**	**15 Marks**
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
CO-5		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 10 marks

The marks allocated for Continuous mode of internal assessment shall be awarded as per the scheme given below: Two tests (each for 20 marks) of 2 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 5marks will be the marks scored in Sessional Examination.

Component - 2: 15 marks

A 2-hour duration Semester End Practical Examination will be conducted for maximum marks of 15.

Both components will be moderated by a second examiner.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for YEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the academic year. Course reassessment policies are presented in the Academic Regulations document.

4. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and Viva voce
11.	Presentation Skills	Laboratory reports
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory reports
14.	Personal Management	Course work
15.	Leadership Skills	Group work

5. Course Resources

a. Class Notes

b. Essential Reading

a. Prague, C. N., (2003) Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath. New Delhi: Wiley Dreamtech India (P) Ltd.
b. Cox, J and Lambert J., (2013) Step by Step, Microsoft Access 2010. Microsoft Press: Washington

c. **Websites**

a. W3Schools – "SQL Tutorial" www.w3schools.com
b. www.codeacademy.com
c. http://access.mvps.org

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 3

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Organic Chemistry II Theory

Course Title	Pharmaceutical Organic Chemistry II Theory
Course Code	BPC224
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of the course is to introduce the chemistry of aromatic and cyclic organic compounds to the students. It also helps in understanding different classes of organic compounds based on functional groups, chemical characteristics, and their reaction mechanisms. This course emphasizes on reactions and synthesis of poly-nuclear hydrocarbons, stability aspects of cycloalkanes, chemistry of fats and oil and to prepare the students for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	Total Marks:100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Identify the structure, properties, stability and uses of organic compounds
- **CO-2** Discuss the products obtained through organic reactions and mechanism involved in their formation
- **CO-3** Explain the classification, physicochemical properties and analytical constants of fats and oils

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

CO-4 Summarise the synthesis and chemistry of polynuclear hydrocarbons

4. Course Contents

Unit 1 **10 Hours**

Benzene and its derivatives

a. Analytical, synthetic, and other evidence in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule

b. Reactions of benzene - nitration, sulphonation, halogenation reactivity, Friedel crafts alkylation-reactivity, limitations, Friedel crafts acylation.

c. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction

d. Structure and uses of DDT, Saccharin, BHC and Chloramine

Unit 2 **10 Hours**

Phenols - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols

Aromatic Amines - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts

Aromatic Acids –Acidity, effect of substituents on acidity and important reactions of benzoic acid.

Unit 3 **10 Hours**

Fats and Oils

a. Fatty acids – reactions.

b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.

c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

Unit 4 **08 Hours**

Polynuclear hydrocarbons

a. Synthesis, reactions

b.Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

Unit 5 **07 Hours**

Cyclo alkanes

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	2											2	
CO-2	3											3	
CO-3	3											3	
CO-4	2											2	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			x	x
CO-2		x	x	x
CO-3			x	x
CO-4			x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class Notes**

b. **Essential Reading**

1. Morrison, R.T. and Boyd, R.N. (2008) Organic Chemistry, 6th Edition, New Jersey: Prentice Hall Pvt Ltd.
2. Graham Solomons, T.W. (1996) Organic Chemistry. 6th Edition. USA: John Wiley &Sons, Inc.
3. Vogel, Finar, IL. (1990) Organic Chemistry – The Fundamental Principles Volume – I. 6th Edition. London: ELBS Publishers.

c. **Recommended Reading**

1. March, J. (1992) Advanced Organic Chemistry. 4th Edition. Singapore: Wiley Inter Science

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Publication.
2. Bansal, RK. (2003) Heterocyclic Chemistry. 4th Edition. New Delhi: New Age International Publishers.
3. Eliel, EL. (1998) Stereochemistry of Carbon Compounds. New Delhi: Tata Mc.Graw Hill Publishing Company.
4. Atherden, LM. (1995) Bentley and Driver's Textbook of Pharmaceutical Chemistry. 8th Edition. New Delhi: Oxford University Press.

d. Magazines and Journals

1. Indian Journal of Chemistry Section – B, New Delhi, National Institute of Science Communication and Information Resources, CSIR
2. Indian Journal of Pharmaceutical Sciences, Benaras, Indian Pharmaceutical Association
3. Asian Journal of Chemistry, Ghaziabad, Asian Publication Corporation

e. Websites

1. www.rsc.org
2. www.chemtube3d.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Physical Pharmaceutics I Theory

Course Title	Physical Pharmaceutics I Theory
Course Code	BPC225
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The course deals with the influence of physicochemical properties in the development of dosage forms/formulations. The course enables students to get a better insight into areas of formulation development and stability aspects of pharmaceutical dosage forms

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture:Tutorial:Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain and interpret the physicochemical principles governing drug solubility, distribution, and diffusion in pharmaceutical and biological systems

CO-2 Analyze surface and interfacial phenomena, adsorption, and complexation processes influencing drug formulation and stability

CO-3 Evaluate the influence of states of matter and physicochemical properties of drug molecules on pharmaceutical product performance

CO-4 Apply the principles of pH, buffers, and isotonic solutions in the design and optimization of pharmaceutical formulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 (Solubility of drugs): Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications **10 hours**

Unit 2 (Surface and interfacial phenomenon): Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface. **10 hours**

Unit 3 (Complexation and protein binding): Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants. **10 hours**

Unit 4 (States of Matter and properties of matter): State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism.

(Physicochemical properties of drug molecules): Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications **08 hours**

Unit 5 (pH, buffers and isotonic solutions): Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions **07 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		2									2	
CO-2	3		2									2	
CO-3	2		2									2	
CO-4	3		3									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1.Demonstration using Videos	03	
2. Demonstration using Physical Models / Systems	02	
3. Demonstration on a Computer	00	
Tutorials		15
1. Solving Numerical Problems/solving doubts	00	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		05
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2, SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leaders.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.

Dean
Faculty of Pharmacy
S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Classroom lectures, Self-study
3.	Critical Skills	Assignment
4.	Analytical Skills	Assignment
5.	Problem Solving Skills	Assignment, Examination
6.	Practical Skills	Assignment
7.	Group Work	--
8.	Self-Learning	Self-study
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	--
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

1. Class notes
2. Patrick J. Sinko. (2006) *Martin's Physical Pharmacy and Pharmaceutical Sciences.* 5th Ed. Lippincott Williams & Wilkins.
3. Carter S. J. (2008) *Cooper and Gunn's-Dispensing for Pharmaceutical students*. 12th Ed.New Delhi: CBS publishers.
4. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
5. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
6. Sinko P.J. (2010) *Physical Pharmacy*. 6th Ed. Philadelphia: Lea and Febiger

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Registrar (Academics)
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Alfonso R Gennaro. (2012) *Remington: The science and practice of pharmacy, Vol- I andVol–II* .22nd Ed. New Delhi: Lippincott Williams and Wilkins.
8. Eugene, L.Parott. (1997) *Experimental Pharmaceutics*. Minneapolis, Minn.BurgessPub.Co.,
9. Mitchell J.Stocklosa. (1991) Pharmaceutical calculations, Lea &Febiger, Philadelphia.

b. Recommended Reading

a. Rawlins, EA. (2008) *Bentley's text book of Pharmaceutics*. 8th Ed. English Language Book
b. Howard C Ansel, Loyd Allen. (2013) *Ansel's Pharmaceutical Dosage form and Drug delivery system*. 10th Ed. New Delhi: Lippincott Williams and Wilkins.
c. Leon L. & Liebermann H. A. (2009) *The Theory and Practice of Industrial Pharmacy*. 1st Ed.New Delhi: CBS publishers.
d. Government of India. (2007) *Indian Pharmacopoeia*. New Delhi: Government of India.
e. Aulton M.E. (2002) *Pharmaceutics: The Science of Dosage Form Design*. 2nd Ed. Edinburgh:Churchill Livingstone.

c. Magazines and Journals

1. European Journal of Pharmaceutical sciences. Elsevier, USA
2. International Journal of Pharmaceutics. Elsevier, USA

d. Websites

1. www.elsevier.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Microbiology Theory

Course Title	Pharmaceutical Microbiology Theory
Course Code	BPC226
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course deals with the essentials of microbiology relevant to pharmacy. The course is designed to impart knowledge on the types of microbes, their identification and methods of control. The course facilitates students to gain understanding on the evaluation and standardization of antimicrobials and to prepare them for further study in the course discipline

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks8
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain and interpret the structure, classification, and characteristics of microorganisms (bacteria, fungi, viruses) and the principles of microscopy used in their identification
- **CO-2** Analyze and apply microbial growth kinetics, cultivation techniques, and biochemical identification methods to solve problems related to microbial isolation and characterization
- **CO-3** Evaluate and justify the selection of sterilization, disinfection, and sterility testing methods based on pharmaceutical standards (IP, BP, USP) and specific product requirements
- **CO-4** Assess and design strategies for contamination control, preservation, and microbial stability of

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

pharmaceutical products, including applications of cell culture techniques.

4. Course Contents

Unit 1:

Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes. Study of ultra-structure and morphological classification of bacteria. Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.

10 hours

Unit 2:

Nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count)

Identification of bacteria using staining techniques (Simple, Gram's & Acid-fast staining) and biochemical tests (IMViC). **10 hours**

Unit 3:

Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods.

Equipment employed in large scale sterilization. Sterility indicators. Classification and mode of action of disinfectants. Factors influencing disinfection, antiseptics and their evaluation for bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP. **10 hours**

Unit 4:

Designing of aseptic area, laminar flow equipment; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic. **08 hours**

Unit 5:

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2	2		2									3	
CO-3	2		3									3	
CO-4	1		3									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff-student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.

Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Hugo WB. and Russell AD. (1998) Pharmaceutical Microbiology. 6th Edition. Blackwell Science
2. Pelczar MJ, Chan ECS, Krieg NR (1986) Microbiology. 5th Edition. New Delhi: McGraw-Hill
3. Rawlins EA (1977) Bentley's Textbook of Pharmaceutics. 8th Edition. London: Bailliere Tindall. medical publishers, New Delhi

c. Recommended Reading

1. Breed RS, Murray EGD and Smith NR (1994) Bergey's Manual of Determinative Microbiology, 9th Edition. Baltimore: William and Wilkinson
2. Prescott LM, Harley JP, Klein DA. (1990) Microbiology. 5th Edition. USA: Wm. C. Brown Publishers

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Ananthanarayan, R. and Paniker, CKJ. (2005) Textbook of Microbiology. 7th Edition. India: Orient Longman Pvt Ltd.
4. Gennaro, AR. (n.d.) Remington's The Science and Practice of Pharmacy. 22nd Edition. Philadelphia: Lippincot, Wiliams and Wilkins.
5. Tortora, GJ., Funke, BR. & Case C.L. (2010) Microbiology: An Introduction. 10th Edition. New York: Benjamin Cummings.
6. Carter SJ. (2005) Cooper and Gunn's Tutorial Pharmacy. 6th Edition. New Delhi: CBS Publishers.
7. Ministry of Health and Family Welfare (2014) Indian Pharmacopoeia. 7th Edition. New Delhi: Government of India.

d. Magazines and Journals

1. Microbiology. Microbiology Society, United Kingdom.
2. International Journal of Microbiology, Hindawi ,United Kingdom

e. Websites

1. www.cellsalive.com
2. www.cdc.gov
3. www.microbiologyonline.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Engineering (Theory)

Course Title	Pharmaceutical Engineering Theory
Course Code	BPC227
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

I. Course Summary

The aim of this course it to impart a fundamental knowledge on the art and science of unit operations used in pharmaceutical industry. The course is designed to prepare students for better understanding of engineering aspects of pharmaceutical equipments and for further study in the course discipline.

2. Course Size and Credits

Number of Credits	04
Credit Structure (Lecture:Tutorial:Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	**100** **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: **75 Marks**
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes

After the successful completion of this course, the student will be able to:

- **CO-1** Demonstrate an understanding of the basic concepts and principles of pharmaceutical engineering
- **CO-2** Classify, compare and contrast the types, mechanisms, and applications of pharmaceutical equipments
- **CO-3** Determine process parameters related to unit operations and evaluate their efficiency
- **CO-4** Propose appropriate materials for pharmaceutical plant construction and examine the key factors influencing their selection

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1

Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturi meter, Pitot tube and Rotometer.

Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

10 Hours

Unit 2

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.

Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

10 Hours

Unit 3

Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier

08 Hours

Unit 4

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seitz filter.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge

08 Hours

Unit 5

Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, theories of corrosion, types of corrosion and their prevention. Handling of Ferrous and non-ferrous metals, inorganic, organic materials, basics of material handling systems.

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean- Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		3									3	
CO-2	3		3									3	
CO-3	3	2	3	2								3	
CO-4	3	2	2									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in Hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		5
1. Demonstration using Videos	3	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer	2	
Tutorials		15
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Written Examination		5
Total Duration in Hours		**65**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination
Maximum Marks	4	6	15	75 Marks
CO-1			x	x
CO-2		x	x	x
CO-3			x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination.

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by the concerned course leader/s.

Reassessment:

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.
Course reassessment policies are presented in the Academic Regulations document

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	....
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	...
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading (Latest Editions)

1. Walter L. Badger, Julius T Banchero. (1955) *Introduction to Chemical Engineering*. 1st Edition. New York: McGraw Hill Company.
2. Nigel JK Simpson. (2000) *Solid phase extraction, Principles, techniques and applications*. Marcel Dekkar Inc, New York.
3. Mcabe Smith. (2005) *Unit Operations of Chemical Engineering*. 7th Edition. McGraw Hill Inc.New York
4. Subramanyam CVS et al., (2016) *Pharmaceutical Engineering – Principles and Practices*. Vallabh Prakashan, New Delhi.
5. Subrahmanyam CVS. (2015) *Physical pharmaceutics*. Vallabh Prakashan, New Delhi.
6. Carter SJ. (2005) *Cooper and Gunn's Tutorial pharmacy*. CBS publsihers and Distributors, New Delhi.

c. Reference Books (Latest Editions)

1. Don W Green, James O Maloney, Robert H Perry. (2003) *Perry's Chemical Engineer's Handbook*. 6th Edition. New York: McGraw Hill Book Company.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. Peters Max. (1984) *Elementary Chemical Engineering*. 2nd Edition: McGraw Hill Book Company, New York.
3. Sambamurthy K. (2012) *Pharmaceutical Engineering*. 1st Edition. New Age International, New Delhi.

d. Magazines and Journals

1. International Journal of Pharmaceutical engineering and drug design. IGI Global, Germany
2. Pharmaceutical engineering. ISPE, USA.

e. Websites

1. www.ispe.org/pharmaceutical-engineering-magazine
2. www.pharmaceuticalengineering.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Title	Pharmaceutical Organic Chemistry II Practical
Course Code	BPL228
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of the course is to provide training on purification of medicinal compounds, their synthesis and analysis.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	Total marks: 50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Apply fundamental laboratory techniques such as recrystallization and steam distillation for purification and separation of organic compound
- **CO-2** Determine physicochemical constants of oils, including acid value, saponification value, and iodine value, using standard analytical procedures
- **CO-3** Perform the synthesis of organic compounds through various chemical reactions

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

A minimum of 12 of the following experiments to be conducted.

I Experiments involving laboratory techniques

- Recrystallization
- Steam distillation

II Determination of following oil values (including standardization of reagents)

- Acid value
- Saponification value
- Iodine value

III Preparation of compounds

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction
- Cinnamic acid from Benzaldehyde by Perkin reaction
- P-Iodo benzoic acid from P-amino benzoic acid.

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			2									2	
CO-2			3					3				3	
CO-3			3					3				3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Practical Work		60
1. Course Laboratory	60	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks
Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Practical	
Attendance (refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	**2**
90 – 94	**1.5**
85 – 89	**1**
80 – 84	**0.5**
Less than 80	**0**

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4 hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Vogel, AI. and Furniss, BS. (1989) Textbook of Practical Organic Chemistry. 4th Edition. London: ELBS Longman.
2. Ministry of Health and Family Welfare, Govt. of India. (2010) Indian Pharmacopoeia. 6th Edition. Ghaziabad: Indian Pharmacopoeia Commission.

b. Reference Books

1. Mann, FG. and Saunders, BC. (1986) Practical Organic Chemistry. 4th Edition. New Delhi: Orient Longman Limited.
2. Vogel, AI. (2004) Elementary Practical Organic Chemistry. 2nd Edition. London: ELBS Longman.
3. Pavia DL. Lampman, GM. Kriz, GS. and Engel, RG. (1990). Introduction to Laboratory. Techniques. 3rd Edition. USA: Saunders College Publishers.

c. Magazines and Journals

1. Indian Journal of Chemistry Section – B, New Delhi, National Institute of Science Communication and Information Resources, CSIR
2. Indian Journal of Pharmaceutical Sciences, Benaras, Indian Pharmaceutical Association
3. Asian Journal of Chemistry, Ghaziabad, Asian Publication Corporation

d. Websites

1. www.rsc.org
2. www.chemtube3d.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Course Specifications: Physical Pharmaceutics I Practical

Course Title	Physical Pharmaceutics I Practical
Course Code	BPL229
Course Type	Core Practical
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to introduce students to the practical aspects of preformulation. Students will be trained to identify and determine the physicochemical parameters of compounds through a series of experiments.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Apply physicochemical principles to evaluate drug properties such as solubility, pKa, partition coefficient, surface tension, and critical micellar concentration through laboratory experiments.
- **CO-2** Analyze adsorption isotherms, surfactant behavior, and complex formation to interpret physicochemical characteristics of pharmaceutical systems.
- **CO-3** Communicate experimental procedures, observations, and results through systematic calculations, reports, and laboratory documentation

4. Course Contents

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3									3	
CO-2			3									3	
CO-3								3					
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		10
1.Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	10	
3. Demonstration on a Computer	00	
Numeracy		00
1. Solving Numerical Problems/solving doubts	00	
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2, SC3 or SC4), COs are assessed as illustrated in the following Table.

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record /Viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks
Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

Practical	
Attendance (refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory work
10.	Verbal Communication Skills	Regular assessment and Viva voce
11.	Presentation Skills	Laboratory reports
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory reports
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Patrick J. Sinko. (2006) *Martin's Physical Pharmacy and Pharmaceutical Sciences.* 5th Ed.Lippincott Williams & Wilkins.
2. Aulton M.E. (2002) *Pharmaceutics: The Science of Dosage Form Design*. 2nd Ed. Edinburgh: Churchill Livingstone.
3. Sinko P.J. (2010) *Physical Pharmacy*. 6th Ed. Philadelphia: Lea and Febiger.
4. Alfonso R Gennaro. (2012) Remington: The science and practice of pharmacy, Vol- I and Vol–II

b. Recommended Reading

1. Rawlins, EA. (2008) *Bentley's text book of Pharmaceutics*. 8th Ed. English languageBook Society.
2. Carter, S J. (2008) *Cooper and Gunn's-Dispensing for Pharmaceutical students*. 12th Ed. New Delhi: CBS publishers.
3. Howard C Ansel, Loyd Allen. (2013) *Ansel's Pharmaceutical Dosage form and Drug delivery system*. 10th Ed. New Delhi: Lippincott Williams and Wilkins.
4. Leon L. & Liebermann H. A. (2009) *The Theory and Practice of Industrial Pharmacy.* 1st Ed. New Delhi: CBS publishers.
5. Government of India. (2007) *Indian Pharmacopoeia*. New Delhi: Government of India.

c. Magazines and Journals

1. International Journal of Pharmaceutics. Medknow Publications. Mumbai
2. European Journal of Pharmaceutical Sciences. Elsevier, United Kingdom.

d. Websites

1. www.elsevier.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Microbiology Practical

Course Title	Pharmaceutical Microbiology Practical
Course Code	BPL230
Course Type	Core Practical
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to train the students on the practical aspects of microbiology through a series of experiments. The course aims to introduce students to microbial cultures, microbial control, and evaluation of antimicrobials and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	Total Marks: 50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 5 Marks 1B: Sessional Exam: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the principles involved in the operation of laboratory equipment used for microbial isolation, identification, sterilization, sterility testing, and antimicrobial standardization

CO-2 Apply appropriate microbiological techniques and utilize modern laboratory tools for microbial identification, isolation, sterilization, and sterility testing

CO-3 Develop oral and written skills for effective communication of experimental results

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

1. Introduction and study of different equipment and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid-fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical tests

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			2	2				1				2	
CO-2			2	3								3	
CO-3								3				1	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		05
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance***	**Practical Record, Viva-voce etc.***	**Sessional Exam***	**Semester End Examination 35 Marks***
Maximum Marks	**2**	**3**	**10**	
CO-1		**X**	**X**	**X**
CO-2		**X**	**X**	**X**
CO-3		**X**	**X**	**X**
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	2.0
90 – 94	1.5
85 – 89	1.0
80 – 84	0.5
Less than 80	0

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

18. Sessional Examination:
Two tests (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination. The total marks of (IA+IB) will be considered for Component - 1.

Component - 2: 35 marks
A 4-hour duration Semester End Examination will be conducted for maximum marks of 35.
Component 2 will be evaluated by course leader and external examiner.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9. Course Resources

b. Class Notes

c. Essential Reading

1. Alexander SK, Strete D. (2001) Microbiology: A Photographic Atlas for the Laboratory. New York: Benjamin Cummings
2. Harley JP, Prescott LM. (2002) Laboratory Exercises in Microbiology. 5th Edition. New York: McGraw-Hill

d. Recommended Reading

1. Stephen, P. Denyer, SP. Hodges, N. Gorman, SP. (2011) Hugo and Russell's Pharmaceutical Microbiology. 8th Edition. USA: Blackwell Science Ltd.
2. Pelczar MJ, Chan ECS, Krieg NR. (1986) Microbiology. 5th Edition. New Delhi: McGraw- Hill.
3. Rawlins, EA. (1977) Bentley's Textbook of Pharmaceutics. 8th Edition. London: Bailliere Tindall.
4. Prescott, LM. Harley, JP. Klein, DA. (1990) Microbiology. 5th Edition. USA: Wm. C. Brown Publishers
5. Ananthanarayan, R, Paniker C.K.J. (2005) Textbook of Microbiology. 7th Edition. India: Orient Longman Pvt Ltd.
6. Tortora, GJ. Funke, BR. Case CL. (2010) Microbiology: An introduction. 10th Edition. New York: Benjamin Cummings
7. Ministry of Health and Family Welfare (2014) Indian Pharmacopoeia. 7th Edition. New Delhi: Government of India

e. Magazines and Journals

1. Microbiology. Microbiology Society, United Kingdom.
2. International Journal of Microbiology, Hindawi ,United Kingdom

e. Websites

1. www.cellsalive.com
2. www.cdc.gov
3. www.microbiologyonline.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Engineering (Practical)

Course Title	Pharmaceutical Engineering Practical
Course Code	BPL231
Course Type	Core Practical
Department	Pharmaceutics
Faculty	Pharmacy

I. Course Summary

The aim of this course is to provide training on the significance of unit operations relevant to pharma industries. The students will be trained to design, execute and interpret the results arising out of several unit operations.

2. Course Size and Credits

Number of Credits	02
Credit Structure (Lecture:Tutorial:Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	**100** **Component 1(IA): 30 %** 1A: Attendance: 2 Marks 1B: Assignment and interaction: 3 Marks 1C: Sessional Exam: 10 Marks **Component 2 (SEE): 70 %** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes

After the successful completion of this course, the student will be able to:

- **CO-1** Demonstrate the functioning and applications of pharmaceutical unit operations
- **CO-2** Plan and conduct experiments using different materials and pharmaceutical equipment for varied unit operations
- **CO-3** Interpret, predict and propose the results based on changes in experimental parameters

4. Course Contents

1. Determination of radiation constant of brass, iron, unpainted and painted glass
2. Steam distillation – To calculate the efficiency of steam distillation
3. To determine the overall heat transfer coefficient by heat exchanger
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/viscosity
12. To study the effect of time on the Rate of Crystallization
13. To calculate the uniformity Index for given sample by using Double Cone Blender

5. Course Map

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		2	2									3	
CO-2		3	2					3				3	
CO-3		2	3					3				3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in Hours	
Face to Face Lectures		
Demonstrations		5
1. Demonstration using Videos	3	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer	2	
Tutorials		55
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation		

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Laboratory Examination		12
Total Duration in Hours		72

7. Course Assessment and Reassessment

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance***	**Practical Record, Viva-voce etc.***	**Sessional Exam***	**Semester End Examination***
Maximum Marks	**2**	**3**	**10**	**35 Marks**
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1*: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

1A: The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Practical	
Attendance (Refer Table below)	2
Practical Records, Regular viva voce etc.	3
Total	5

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional Examination

Two tests (each for 40 marks) of 4 hours duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination.

The total marks of (IA+IB) will be considered for Component 1

Component - 2: 35 marks

A 4-hour duration Semester End Examination will be conducted for maximum marks of 35 which will be evaluated by course leader and external examiner.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory reports
10.	Verbal Communication Skills	Regular assessment and Viva voce

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

11.	Presentation Skills	Laboratory reports
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory Reports
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Leon Lachmann, Herbert A Liebermann. (2009) The Theory and Practice of Industrial Pharmacy.1st Edition. New Delhi: CBS Publishers.
2. Aulton, ME. (2001) Pharmaceutics: The Science of Dosage Form Design. 2nd Edition. Edinburgh: Churchill Livingstone.
3. Banker, Rhodes. (1990) Modern Pharmaceutics. 2nd Edition. New York: Marcel Decker Inc.
4. Howard C Ansel, Loyd Allen. (2013) Ansel's Pharmaceutical Dosage form and Drug delivery system. 10th Edition. New Delhi: Lippincott Williams and Wilkins.
5. Leon Lachmann, Herbert A Liebermann.(1989) Pharmaceutical Dosage Forms- Tablets. 2nd Edition. New York: Marcel Decker Inc.
6. Leon Lachmann, Herbert A Liebermann. (1989) Pharmaceutical Dosage Forms- Parenteral Medication. 2nd Edition. New York: Marcel Decker Inc.

c. Recommended Reading

1. Bharath S. (2012) Pharmaceutics- Formulations and Dispensing Pharmacy. 1st Edition. Asia: Pearson Publishers.
2. Alfonso R Gennaro. (2012) Remington: The Science and Practice of Pharmacy, Vol- I and Vol-II22nd Edition. New Delhi: Lippincott Williams and Wilkins.
3. Carter S J. (2008) Cooper and Gunn's-Dispensing for Pharmaceutical students. 12th Edition. New Delhi: CBS Publishers.
4. Latest Editions of British Pharmacopoeia, United States Pharmacopoeia, Extra Pharmacopoeia, British Pharmaceutical Codex.

d.Magazines and Journals

1. Indian Journal of Pharmaceutical Sciences.
2. International Journal of Pharmaceutical Sciences.

e. Websites

1. www.americanpharmaceuticalreview.com
2. www.pharmamanufacturing.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 4

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Organic Chemistry III (Theory)

Course Title	Pharmaceutical Organic Chemistry III Theory
Course Code	BPC232
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart knowledge on stereo-chemical aspects of organic compounds, chemistry and synthesis of important hetero cyclic compounds and important named reactions. It also emphasizes medicinal and other uses of organic compounds.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Recall and explain the fundamental concepts of heterocyclic compounds
- **CO-2** Outline the methods of synthesis, medicinal uses of heterocyclic compounds and important named reactions used in organic synthesis
- **CO-3** Explain the concept of stereochemistry of organic compounds
- **CO-4** Discuss the configurations and conformations of organic compounds, and their impact on chemical behavior and stability

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 Stereo isomerism:

Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds, Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers, Reactions of chiral molecules, Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute.

10 hours

Unit 2 Geometrical isomerism:

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn-Anti systems). Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions

10 hours

Unit 3 Heterocyclic compounds:

Nomenclature and classification, Synthesis, reactions and medicinal uses of following compounds/derivatives, Pyrrole, Furan, and Thiophene. Relative aromaticity, reactivity and Basicity of pyrrole, Furan, and Thiophene.

10 hours

Unit 4 Synthesis, reactions and medicinal uses of following compounds/derivatives:

Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine. Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

8 hours

Unit 5 Reactions of synthetic importance

Metal hydride reduction ($NaBH_4$ and $LiAlH_4$), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation

07 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2	3												2
CO-3	3												2
CO-4	3												3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

a. Class Notes
b. Morrison, R. T. and Boyd, R. N. (2010) Organic Chemistry 7th edn. Delhi: Pearson Education Private Ltd.
c. Solomon, T. W. G. (2015) Solomon's Organic Chemistry 11th edn. USA: John Wiley and Sons, Inc.
d. Solomon, T. W. G. (2015) Solomon's Organic Chemistry 11th edn. USA: John Wiley and Sons, Inc.

b. Recommended Reading

1. March, J. (2012) Advanced Organic Chemistry 6th edn. Singapore: Wiley Inter Science Publication
2. Bansal, R. K. (2014) Heterocyclic Chemistry 5th edition. New Delhi: New Age International Publishers.
3. Eliel, E. L. (2001) Stereochemistry of Carbon Compounds. New Delhi: Tata Mc.Graw Hill Publishing Company.

c. Magazines and Journals

1. Indian Journal of Chemistry Section –B. New Delhi: Niscair.
2. European Journal of Medicinal Chemistry. Amsterdam: Elsevier.
3. Indian Journal of Pharmaceutical Sciences. Mumbai: IPA.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

d. Websites

a. www.chemtube3d.com
b. www.organic-chemistry.org
c. www.rsc.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramyuth K.V.

Course Specifications: Medicinal Chemistry – I (Theory)

Course Title	Medicinal Chemistry-I Theory
Course Code	BPC233
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. **Course Summary**

The aim of the course is to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The course deals with the structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. It also emphasizes on chemical synthesis of important drugs under each class.

2. **Course Size and Credits:**

Number of credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total hours of Classroom interaction during the semester	45
Number of tutorial hours	15
Number of semester weeks	15
Department responsible	Pharmaceutical Chemistry
Course marks	**Total Mark: 100** **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: **15 Marks** **Component 2 (SEE):** Semester End Examination: **75 Marks**
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Summarise the history and classification of medicinal agents
- **CO-2** Explain the influence of physicochemical properties and drug metabolism on biological activity, including major metabolic pathways
- **CO-3** Discuss the structure–activity relationship (SAR) and understand the mode of action and therapeutic uses of medicinal agents
- **CO-4** Outline the synthetic routes of selected drug molecules using principles of synthetic chemistry

4. Course Contents

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I **10 Hours**

Introduction to Medicinal Chemistry

History and development of medicinal chemistry

Physicochemical properties in relation to biological action: Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism:

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects

UNIT- II **10 Hours**

Drugs acting on Autonomic Nervous System

Adrenergic Neurotransmitters: Biosynthesis and catabolism of catecholamine

Adrenergic receptors (Alpha & Beta) and their distribution

Sympathomimetic agents: SAR of Sympathomimetic agents

- **Direct acting:** Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.
- **Indirect acting agents:** Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- **Agents with mixed mechanism**: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III **10 Hours**

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Parasympathomimetic agents: SAR of Parasympathomimetic agents
Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.
Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathion, Malathion

Cholinesterase reactivator: Pralidoxime chloride.
Cholinergic Blocking agents: SAR of cholinolytic agents
Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropinemesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide Iodide, Ethopropazine hydrochloride

UNIT- IV **08 Hours**

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:
Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem
Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital
Miscelleneous:
Amides & imides: Glutethmide.
Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol.
Aldehyde & their derivatives: Triclofos sodium, Paraldehyde

B. Antipsychotics
Phenothiazines: SAR of Phenothiazeines - Promazinehydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.
Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.
Flurobuterophenones: Haloperidol, Droperidol, Risperidone.
Beta amino ketones: Molindone hydrochloride.
Benzamides: Sulpieride.

C. Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action
Barbiturates: Phenobarbitone, Methabarbital.
Hydantoins: Phenytoin*, Mephenytoin, Ethotoin
Oxazolidinediones: Trimethadione, Paramethadione
Succinimides: Phensuximide, Methsuximide, Ethosuximide*
Urea and monoacylureas: Phenacemide, Carbamazepine*
Benzodiazepines: Clonazepam
Miscellaneous: Primidone, Valproicacid, Gabapentin, Felbamate

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

UNIT – V **07 Hours**

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short-acting acting barbiturates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride. *

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanoltartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	2											2	
CO-2			2										3
CO-3											3	2	3
CO-4											2		
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	03	
2. Demonstration using Physical Models/Systems	02	
3. Demonstration on a Computer	00	
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

3. Engineering Workshop/Course Workshop/Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry/Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1			X	X
CO-2		X	X	X
CO-3			X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Component-1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination.

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both Components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class notes

b. **Essential Reading**

1. Williams DA. (2002) *Foye's Principles of Medicinal Chemistry*, 5th Edition . Philadelphia: Lippincott.
2. Doerge, RF. (1982) *Text Book of Organic Medicinal and Pharmaceutical Chemistry.* 8thEdition. Toronto: Lippincott.
3. Lednicer, D. (2007) *Organic Chemistry of Drug Synthesis* (Vol. I and II); USA: Wiley Interscience.

c. **Recommended Reading**

1. Abraham DJ. (ed.) (2003) *Burger's Medicinal Chemistry and Drug Discovery.* Vol. 1 to 6. 5th Edition. New York: John Wiley and Sons Inc.
2. Patrick, GL. (2009). *An Introduction to Medicinal Chemistry*. 2nd Edition. UK: Oxford University Press.

d. **Magazines and Journals**

1. Indian Journal of Chemistry Section – B. NISCAIR PUBLICATIONS
2. European Journal of Medicinal Chemistry, Published under the auspices of the French Société de Chimie Thérapeutique (SCT)
3. Indian Journal of Pharmaceutical Sciences, Scientific Publication of the *Indian Pharmaceutical* Association

e. **Websites**

1. http://www.cimsasia.com/india
2. http://www.sciencedirect.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Physical Pharmaceutics II Theory

Course Title	Physical Pharmaceutics II Theory
Course Code	BPC234
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course deals with the physicochemical properties and principles of physical chemistry involved in dosage forms and formulations. The components of this course help the student to get a better insight into various areas of pre-formulation research and development including stability studies of pharmaceutical dosage forms. The course provides the basic knowledge required to understand the advanced disciplines of dosage form development.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Tutorial Hours	15
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	**100** **Component 1(IA):25 Marks** 1A: Attendance:4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam:15 Marks **Component 2(SEE):** Semester End Examination:75Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

3. Course Outcomes (CO)

After the successful completion of this course, the student will be able to:

CO-1 Explain the principles and properties of colloidal systems and rheological behavior of pharmaceutical dispersions

CO-2 Apply rheological and micromeritics principles to evaluate flow behavior, particle characteristics, and powder properties in pharmaceutical systems

CO-3 Analyze the formulation and stability of suspensions and emulsions based on interfacial properties and stabilization methods

CO-4 Determine reaction kinetics and factors affecting drug stability to predict degradation and estimate shelf life of pharmaceutical products

4. Course Contents

Unit 1 (Colloidal dispersions): Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids& comparative account of their general properties Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.

07 hours

Unit 2 (Rheology): Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling sphere, rotational viscometers
Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

08 hours

Unit 3 (Coarse dispersion): Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, micro emulsion and multiple emulsions; stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

10 hours

Unit 4 (Micromeritics): Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement. Densities, bulkiness and flow properties

10 hours

Unit 5 (Drug stability): Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, Specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis and oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention. **10 hours**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											2	
CO-2	3											2	
CO-3	2		3									2	
CO-4	3		3									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hrs	Total Duration In Hours
Face to Face Lectures		40
Demonstrations		5
1. Demonstration using Videos	3	
2. Demonstration using Physical models/Systems		
3. Demonstration on a Computer	2	
Tutorials		15
Practical Work		
1.Course Laboratory		
2.Computer Laboratory		
3.Engineering Workshop/Course Workshop/Kitchen		
4.Clinical Laboratory		
5.Hospital		
6.Model Studio		
Others		
1.Case Study Presentation		
2.Guest Lecture		
3. Industry/Field Visit		
4.Brain Storming Sessions		
5.Group Discussions		
6.Discussing Possible Innovations		
Term tests, Written Examination		05
Total Duration in Hours		**65**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.
The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component-1:25marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95--100	4
90--94	3
85--89	2
80--84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination.

Component-2: 75marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75

Both components will be evaluated by concerned course leaders.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	....
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	...
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Coursework
13.	Information Management	Assignment, examination
14.	Personal Management	Coursework
15.	Leadership Skills	Coursework

9. Course Resources

a. Class notes

b. Essential Reading

1. Patrick J. Sinko.(2006)*Martin's Physical Pharmacy and Pharmaceutical Sciences.*5thEd. Lippincott Williams & Wilkins.
2. Carter S.J. (2008) *Cooper and Gunn's-Dispensing or Pharmaceutical students.*12thEd. New Delhi: CBS publishers.
3. Liberman H.A, Lachman C., Pharmaceutical dosage forms, Tablets, Vol. 1-3, Marcel Dekkar Inc.
4. Sinko P.J (2010) *Physical Pharmacy.*6thEd.Philadelphia:LeaandFebiger
5. Alfonso R Gennaro. (2012) *Remington: The science and practice of pharmacy, Vol-I and Vol–II.*22ndEd. NewDelhi: Lippincott Williams and Wilkins.
6. Eugene, L. Parott. (1997)*Experimental Pharmaceutics* Minneapolis,

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Minn. Burgess Pub.Co.,

7. Mitchel J. Stocklosa. (1991)Pharmaceutical calculations, Lea & Febiger, Philadelphia.
8. Ramasamy C, Manavalan R (2015) Physical Pharmaceutics, Vignesh Publishers, Chennai.

c. Recommended Reading

1. Howard C Ansel, Lloyd Allen. (2013) *Ansel's Pharmaceutical Dosage Form And Drug delivery system*. 10th Ed. New Delhi: Lippincott Williams and Wilkins.
2. LeonL & Liebermann H.A (2009) *The Theory and Practice of Industrial Pharmacy*. 1st Ed.New Delhi: CBS publishers.
3. Government of India. (2007) *Indian Pharmacopoeia*. New Delhi: Government of India.
4. Aulton M.E. (2002) *Pharmaceutics: The Science of Dosage Form Design*.2nd Ed.

d. Magazines and Journals

1. Indian Journal of Pharmaceutical Sciences
2. International Journal of Pharmaceutics, Elsevier, Science Direct

e. Websites

www.sciencedirect.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacology-I Theory

Course Title	Pharmacology-I Theory
Course Code	BPC235
Course Type	Core Theory
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate students on drugs and their actions on the human body and their therapeutic applications. This course facilitates students to gain better understanding on pharmacodynamics and pharmacokinetics of drugs and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional exam: 15 Marks **Component 2 (SEE): 75 Marks** Semester End Examination: 75Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Summarize pharmacological terminologies, drug development stages, and regulatory phases.
CO-2 Explain pharmacokinetics and pharmacodynamics, including mechanisms of drug action and receptor theories.
CO-3 Analyze adverse drug reactions and drug interactions to ensure safe and effective therapy.
CO-4 Describe the pharmacology of drugs acting on the peripheral and central nervous systems.

4. Course Contents

Unit 1: General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists (competitive and noncompetitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs. Enzyme induction, enzyme inhibition, kinetics of elimination **8 hours**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 2: General Pharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein– coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
b. Adverse drug reactions
c. Drug interactions (pharmacokinetic and pharmacodynamics)
d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance. **12 Hours**

Unit 3: Pharmacology of drugs acting on peripheral nervous system

a. Organization and function of ANS
b. Neurohumoral transmission, co-transmission and classification of neurotransmitters
c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, Sympatholytics.
d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
e. Local anesthetic agents
f. Drugs used in myasthenia gravis and glaucoma **10 hours**

Unit 4: Pharmacology of drugs acting on central nervous system

a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine
b. General anesthetics and pre-anesthetics
c. Sedatives, hypnotics and centrally acting muscle relaxants
d. Anti-epileptics
e. Alcohols and disulfiram **8 Hours**

Unit 5: Pharmacology of drugs acting on central nervous system

a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-maniacs and hallucinogens.
b. Drugs used in Parkinson's disease and Alzheimer's disease
c. CNS stimulants and nootropics
d. Opioid analgesics and antagonists
e. Drug addiction, drug abuse, tolerance and dependence **7 Hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	1
CO-2		3										3	1
CO-3			3			2						3	2
CO-4											1	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		5
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document. The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1			x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The details of SC1, SC2, SC3 are presented in the Programme Specifications Document

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination.

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	---
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	---
11.	Presentation Skills	Assignment, examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, examination

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

1. Class notes
2. Rang,M.P., Dale, M.M. and Riter, J.M. (2015) Pharmacology.8th edn. China: Churchill Livingstone.
3. Katzung, B. G. (2009) Basic and Clinical Pharmacology.11th edn. New Delhi: Tata McGraw Hill.
4. Tripathi, K.D. (2013) Essentials of Medical Pharmacology.7th edn. New Delhi: Jaypee Brothers.
5. Sharma, H. L. and Sharma, K. K. (2011) Principles of Pharmacology. 2nd edn. New Delhi: Paras Publishing.

b. Recommended Reading

1. Rang, M. P., Dale, M. M. and Riter, J.M. (2015) Pharmacology. 8thedn. China: Churchill Livingstone.
2. Katzung, B.G. (2009) Basic and Clinical Pharmacology.11th edn. New Delhi: Tata McGraw Hill.
3. Goodman, L. S., Gilman, A., Brunton, L. L., Lazo, J. S. and Parker, K. L. (ed.) (2011) Goodman and Gilman's The Pharmacological Basis of Therapeutics. 12th edn. New York: McGraw Hill Education.
4. Marry Anne, K. K., Lloyd Yee, Y., Brian, K. A., Robbin, L.C., Joseph, G. B., Wayne, A. K., Bradley, R.W. (2011) Applied Therapeutics, The Clinical use of Drugs. 10th edn., USA: Lippincott Williams & Wilkins.
5. Michelle, A. C., Richard, F., Jose, A. R. and Karen, W. (ed.) (2011) Lippincott's Illustrated Reviews Pharmacology. 5th edn. China: Lippincott Williams & Wilkins.
6. Tripathi, K.D. (2013) Essentials of MedicalPharmacology.7th edn. New Delhi: Jaypee Brothers.
7. Sharma, H. L. and Sharma, K. K. (2011) Principles of Pharmacology. 2nd edn. New Delhi: Paras Publishing.
8. Stitzel, R. E., Craig, C. R. (2012) Modern Pharmacology with Clinical Applications. 6th edn. USA: Lippincott Williams & Wilkins.
9. Ghosh, M. N. (2008) Fundamentals of Experimental Pharmacology. 6th edn. Kolkata: Hilton & Company.
10. Kulkarni, S. K. (2010) Handbook of Experimental Pharmacology. 3rd edn. Delhi: Vallabh Prakashan.

c. Magazines and Journals

1. Indian Journal of Pharmacology
2. Journal of Pharmacy and Pharmacology
3. Indian Drugs
4. Drug USA
5. ICH, OECD and USFDA Guidelines

d. Websites

1. www.icp.org.nz
2. www.craigslist.org
3. www.drug lib.com

e. Other electronics Resources

1. Kathryn I. Mccance, RN, and Sue E. Huether, Pathophysiology Online for Pathophysiology, 6th Edition, The biologic Basis for Disease in Adults and Children, College of Nursing University of Utah, Salt Lake City, UT.
2. Esther Chang, John Daly, Doug Elliot (2006) Pathophysiology Applied to Nursing Practice, Australia: Elsevier.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacognosy & Phytochemistry-I (Theory)

Course Title	Pharmacognosy & Phytochemistry-I Theory
Course Code	BPC236
Course Type	Core Theory
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart the basic knowledge of Pharmacognosy. It imparts knowledge on classification of crude drugs, their identification and evaluation of phytochemicals. It also emphasizes on plant tissue culture, marine drugs and traditional systems of medicine.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	70
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Outline evolution, scope of Pharmacognosy and principles of traditional systems of medicine
- **CO-2** Explain classification, pharmacognostical scheme and evaluation of crude drugs
- **CO-3** Elaborate cultivation, collection and processing of drugs of natural origin including modern aspects
- **CO-4** Discuss Plant tissue culture techniques and its applications

4. Course Contents

Unit 1(Introduction to Pharmacognosy):

a. Definition, history, scope and development of Pharmacognosy

Sources of Drugs – Plants, Animals, Marine & Tissue culture

Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

b. Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

c. Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

biological methods and properties.
Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida. **10 hours**

Unit 2 (Cultivation, Collection, Processing and storage of drugs of natural origin):
a. Cultivation and Collection of drugs of natural origin and its propagation methods
b. Factors influencing cultivation of medicinal plants.
c. Plant hormones and their applications.
d. Polyploidy, mutation and hybridization with reference to medicinal plants
e. Conservation of medicinal plants **10 hours**

Unit 3 (Plant tissue culture):
a. Historical development of plant tissue culture, types of cultures (callus, suspension, protoplast, hairy root), Nutritional requirements, growth and their maintenance.
b. Applications of plant tissue culture in pharmacognosy.
c. Edible vaccines **07 hours**

Unit 4:
Introduction to secondary metabolites:
Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins **10 hours**

Unit 5 (Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs):
a. Plant Products:
Fibers - Cotton, Jute, Hemp
Hallucinogens, Teratogens, Natural allergens
b. Primary metabolites:
General introduction, detailed study with respect to chemistry, sources, preparation, valuation, preservation, storage, therapeutic uses and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:
Carbohydrates: Acacia, Agar, Tragacanth, Honey
Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serration peptidase, urokinase, streptokinase, pepsin).
Lipids (Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax
c. Marine Drugs:
Novel medicinal agents from marine sources **08 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	1												
CO-2	3												
CO-3	3										3	3	2

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

CO-4	2											2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and	Sessional Exam	Semester End Examination

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

		Student Interaction		75 Marks
Maximum Marks	**4**	**6**	**15**	
CO-1			X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.
Both components will be evaluated by concerned course leader/s.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

a. Evans, W. C. (2009) Trease and Evans Pharmacognosy. 16th ed. London: W.B. Sounders & Co.

b. Tyler, V.E., Brady, L.R. and Robbers, J.E., (1988) Pharmacognosy. 9th ed. Philadelphia: Lea and Febiger.

c. Wallis, T.E. (2005) Text Book of Pharmacognosy. 5th ed. India: CBS Publishers and Distributors.

d. Mohammad Ali. (2015) Pharmacognosy and Phytochemistry. 1st ed. New Delhi:CBS Publishers & Distribution.

5. Kokate, C.K., Purohit, A.P., Gokhlae, S.B. (2010) Pharmacognosy. 45thed. Pune:Nirali Prakashan.

6. Choudahry, R.D. (1996) Herbal drug industry. 1st ed. New Delhi: Eastern Publisher.

7. Ansari, S.H. (2007) Essentials of Pharmacognosy. 2nd ed. New Delhi: Birla publications.

8. Kokate, C.K., Purohit., A.P, Gokhlae, S.B.(2008) Practical Pharmacognosy. 14th ed, Pune: NiraliPrakashan.

9. Iyengar, M.A. (2011) Anatomy of Crude Drugs. 12th ed. Manipal: Manipal Power Press.

c. Recommended Reading

1. AshutoshKar. (2003) Pharmacognosy and Pharmacobiotechnology. 1st ed. New Delhi: New Age International Publishers.

2. Rangari, V.D. (2003) Pharmacognosy and Phytochemistry. 1st ed. Nashik: Career Publications.

3. Gupta, P.K. (2004) Elements of Biotechnology. 1st ed. New Delhi: Rastogi Publications.

4. Vyas, S.P and Dixit, V.K. (1999) Pharmaceutical biotechnology. 1st ed. New Delhi: CBS Publishers and Distributors.

d. Magazines and Journals

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. Pharmacognosy Magazine - Phcog.Net, Bangalore.
2. Journal of Natural products – ACS Publications, Washington
3. Indian Journal of Natural Products and Resources – NISCAIR, New Delhi.

e. Websites

1. www.phcognet.com
2. Herbnet.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Medicinal Chemistry I (Practical)

Course Title	Medicinal Chemistry- I Practical
Course Code	BPL237
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this subject is to perform estimation/assays of medicinally important compounds by applying different titrimetric analysis, to synthesize medicinal compounds and to determine the partition coefficient of drugs

2. Course Size and Credits: Number of credits

Number of credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total hours of lab interaction during the semester	60
Number of tutorial hours	00
Number of semester weeks	15
Department responsible	Pharmaceutical Chemistry
Course marks	**Total Mark: 50** **Component 1(CE): 15 Marks** Part A: Continuous mode: 05 Marks Par B: Sessional Exam: 10 Marks **Component 2 (SEE):** Semester End Examination: **35 Marks**
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Apply synthetic chemistry techniques to prepare compounds of medicinal importance
CO-2 Analyze and evaluate the purity of drugs using appropriate assay methods
CO-3 Analyze the partition coefficient of pharmaceutical compounds

4. Course Contents: Suggested Practicals

Minimum of 12 of the following experiments are to be conducted
I Preparation of drugs/ intermediates
Preparation of 1,3-pyrazole

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Preparation of 1,3-oxazole
Preparation of Benzimidazole
Preparation of Benztriazole
Preparation of 2,3- diphenylquinoxaline
Preparation of phenothiazine
Preparation of Benzocaine
Preparation of Phenytoin
Preparation of Barbiturate

II Assay of drugs

Assay of chlorpromazine
Assay of phenobarbitone
Assay of atropine
Assay of Ibuprofen
Assay of aspirin
Assay of furosemide
Assay of mefenamic Acid

III Determination of Partition coefficient for any two drugs

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			2					3				2	
CO-2			3					3					2
CO-3			1										
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		
Demonstrations		05
1. Demonstration using Videos	03	
2. Demonstration using Physical Models/Systems	02	
3. Demonstration on a Computer	00	
Practical work		55
1. Course Laboratory	55	
2. Computer Laboratory	00	
3. Engineering Workshop/Course Workshop/Kitchen	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry/Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations		
Laboratory Examination		12
Total Duration in Hours		72

7. Course Assessment and Reassessment

The details of the components and subcomponents of the course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30 % Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent▶	**SC1**	**SC2**	**SC3**	
Subcomponent Type ▶	**Attendance**	**Practical Records, Regular viva voce, etc.**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks▶	**2**	**3**	**10**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks (CE)

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
1A: Attendance (Refer Table below)	2
1B: Based on Practical Records, Regular viva voce, etc.	3
Total	5

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

Part B: Sessional examination

Two sessional exams (each for 40 marks) of 4-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination.

Component - 2: 35 marks (SEE)

A 4-hour duration Semester End Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Re-assessment

1. A student who fails to secure a minimum of 50% in component-1 and 2 put together will be asked to register for the Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for the Supplementary examination.
3. The maximum number of such opportunities is limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of the assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Course Notes

b. Essential reading

1. Vogel, AI. And Furness, BS. (1989) *Textbook of Practical Organic Chemistry*.4th Edition.London: ELBS Longman.
2. Ministry of Health and Family Welfare Govt. of India. (2010) *Indian Pharmacopoeia*. 6th Edition. Ghaziabad: Indian Pharmacopoeia Commission

c. Recommended Reading

7. Mann, FG. and Saunders, BC.(1986) Practical Organic Chemistry. 4th Edition., New Delhi: Orient Longman Limited
8. Vogel, AI. (2004) Elementary Practical Organic Chemistry. 2nd Edition. London: ELBS Longman.
9. Pavia, DL. Lampman, GM. Kriz, GS. and Engel, RG.(1990).*Introduction to Laboratory Techniques*. 3rd Edition. USA: Saunders College Publishers.

d. Magazines and journals

1. Indian Journal of Chemistry Section – B.NISCAIR PUBLICATIONS
2. European Journal of Medicinal Chemistry.Published under the auspices of the French Société de ChimieThérapeutique (SCT)www.sciencedirect.com
3. Indian Journal of Pharmaceutical Sciences.Scientific Publication of the *Indian Pharmaceutical* Association

e. Websites

1.http://www.cimsasia.com/india
2.http://www.newdruginfo.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Physical Pharmaceutics II Practical

Course Title	Physical Pharmaceutics II Practical
Course Code	BPL238
Course Type	Core Practical
Department	Pharmaceutics
Faculty	Pharmacy

1. **Course Summary**

The aim of this course is to introduce pre-formulation studies of a new drug through a series of experiments. The course enables the student to get an insight into the various areas of formulation research, development and stability studies of pharmaceutical dosage forms.

2. **Course Size and Credits**

Number of credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total hours of Classroom interaction during the semester	60
Number of tutorial hours	00
Number of semester weeks	15
Department responsible	Pharmaceutics
Subject marks	**Total Marks:50** **Component1(IA):15 Marks** 1A: Continuous mode: 05 marks 1B: Sessional Exam: 10 Marks **Component2(SEE):** Semester End Examination: 35 Marks
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. **Course Outcomes (CO)**

After undergoing this subject student will be able to:

CO-1 Determine particle size distribution, density, porosity, flow properties, and viscosity of pharmaceutical materials using appropriate experimental methods.

CO-2 Analyze sedimentation behavior of suspensions and reaction rate constants of first and second order reactions

CO-3 Communicate experimental procedures, observations, and results through systematic calculations, reports, and laboratory documentation

4. **Course Contents**

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination of sedimentation volume with effect of different suspending agents
7. Determination of sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of first order reaction rate constant.
10. Determination of second order reaction rate constant
11. Accelerated stability studies

5. **Course Map (CO-PO-PSO Map)**

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3									2	
CO-2			3									2	
CO-3								3				2	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in Hours
Face to Face Lectures		05
Demonstrations		05
1. Demonstration using Videos		
2.Demonstration using Physical Models/Systems		
3.DemonstrationonaComputer	5	
Numeracy or Tutorials		
1.Solving Numerical Problems		
Practical Work		50
1.Course Laboratory	50	
2.Computer Laboratory		
3.Engineering Workshop/Subject Workshop/Kitchen		
4.Clinical Laboratory		
5.Hospital		
6.Model Studio		
Others		
1.CaseStudyPresentation		
2.Guest Lecture		
3.Industry/Field Visit		
4.Brain Storming Sessions		
5.Group Discussions		
6.Discussing Possible Innovations		
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.
The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation			
	Component 1: CE (25% Weightage)		Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	
Subcomponent Type	Continuous mode	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	5	10	
CO-1		X	X
CO-2		X	X
CO-3		X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.			

Component-1: 15marks
Conduct of Laboratory Exercises and Sessional examinations
1A: Continuous mode : 05 Marks
1B: Sessional examination: 10 Marks

1A: The marks allocated for continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Practical	
Attendance (Refer Table below)	2
Based on Practical Records, Regular viva voce, etc.	3
Total	**5**

Guidelines for the allotment of marks for attendance

Percentage of Attendance	Practical
95–100	2
90–94	1.5
85–89	1
80–84	0.5
Less than 80	0

1B: Sessional examination

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Two tests (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of 12th week. The average of the 2 sessional marks reduced to10 will be the marks scored in the Sessional Examination.

The total marks of (IA+IB) will be considered for Component-1.

Component-2: 35marks
A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the subject
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory reports
10.	Verbal Communication Skills	Regular assessment and Viva-voce
11.	Presentation Skills	Laboratory reports
12.	Behavioural Skills	Coursework

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

13.	Information Management	Laboratory reports
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Lab Manual
2. Patrick J.Sinko.(2010)*Martin's Physical Pharmacy and Pharmaceutical Sciences* .5thEd. Lippincott Williams & Wilkins.
3. Aulton M.E. (2002) *Pharmaceutics: The Science of Dosage Form Design.* 2nd Ed.Edinburgh:Churchill Livingstone.
4. Alfonso R Gennaro.(2012) *Remington: The science and practice of pharmacy, Vol-I and Vol–II* .22ndEd.New Delhi:Lippincott Williams andWilkins.

b. Recommended Reading

1. Rawlins, EA.(2008)*Bentley's text book of Pharmaceutics*.8thEd. English language Book Society.
2. Howard C Ansel, Loyd Allen. (2013) *Ansel's Pharmaceutical dosage form and drug delivery system* 10thEd. NewDelhi: Lippincott Williams and Wilkins.
3. Leon L. &Liebermann H. A. (2009) *The Theory and Practice of Industrial Pharmacy.* 1st Ed. New Delhi: CBS publishers.
4. Government of India.(2007) *Indian Pharmacopoeia.* New Delhi: Government of India.

c. Magazines and Journals

1. Indian Journal of Pharmaceutical Sciences
2. International Journal of Pharmaceutics, Elsevier, Science Direct.

d. Websites

www.sciencedirect.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacology I Practical

Course Title	Pharmacology I Practical
Course Code	BPL239
Course Type	Core Practical
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart training on the principles of experimental pharmacology to facilitate better understanding on drug evaluation process and prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 5 Marks 1B: Sessional Exam: 10 Marks **Component 2 (SEE): 35 Marks** Semester End Examination: 35Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Perform common laboratory techniques and identify routes of drug administration in animals.
CO-2 Demonstrate drug actions and behavioral responses using computer models and simulated experiments
CO-3 Apply ethical considerations and CPCSEA guidelines for laboratory animal maintenance and handling.

4. Course Contents

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods.

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software and videos

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1				3								3	2
CO-2			2									3	2
CO-3							3					3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Laboratory examination	12
Total Duration in Hours	**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document. The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Based on Practical Records, Regular viva voce, etc.**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 15 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Marks**
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Assignment and interaction with student:

1C. Sessional exam: Two tests (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination.

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35 and evaluated by concerned course leader and External examiner.

Re-assessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory reports
10.	Verbal Communication Skills	Regular assessment and Viva voce
11.	Presentation Skills	Laboratory reports
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory reports
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Kulkarni, S.K. (1999) Hand Book of Experimental Pharmacology, 3rd edn, New Delhi: Vallabh Prakashan.
2. Ghosh, M.N. (2008) Elements of Experimental Pharmacology, 4th edn, Kolkata: Hilton and Company.
3. Goyal, R.K. (2000) Practicals in Pharmacology, 2nd edn, Ahmedabad: BS Shah Prakashan.
4. Vrushabendra Swamy, B.M., Jayaveera, K.N. and Venkateshwar Reddy, A. (2014) Experimental Pharmacology and Toxicology, New Delhi: Chand and Company Pvt. Ltd.

b. Recommended Reading

1. Vogel, H.G. (2002) Drug discovery and evaluation. 2nd edn. New York: Springer.
2. Parmer, N.S. and Prakash, S. (2006) Screening Methods in Pharmacology, New Delhi: Narosa Publishing House.
3. Turner, R.A. (1965) Screening Methods in Pharmacology, New York: Academic Press.

c. Magazines and Journals

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. Indian Journal of Pharmacology
2. Journal of Pharmacology and Experimental Therapeutics
3. European journal of Pharmacology
4. British Journal of Pharmacology

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacognosy & Phytochemistry-I Practical

Course Title	Pharmacognosy & Phytochemistry-I Practical
Course Code	BPL240
Course Type	Core Practical
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to enable students to identify crude drugs based on chemical tests. The students are also trained to perform standardization of crude drugs as per standard guidelines.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	72
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	50
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1	Perform qualitative chemical tests to identify and differentiate crude drugs.
CO-2	Evaluate the quality and purity of crude drugs
CO-3	Apply quantitative microscopy techniques to standardize crude drugs.

4. Course Contents

1. Analysis of crude drugs by chemical tests: (i) Tragacanth (ii) Acacia (iii) Agar (iv) Gelatin (v) Starch(vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains and/or calcium oxalate crystals by eye piece micrometer/camera lucida
5. Determination of fiber length and width by micrometry/camera lucida
6. Determination of number of starch grains by Lycopodium spore method to evaluate crude drug
7. Determination of Ash value
8. Determination of Extractive values of crude drugs

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9. Determination of moisture content/Loss on drying of crude drugs
10. Determination of swelling index
11. Determination of foaming index

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		3	3									2	
CO-2		3	3									2	
CO-3		3	3									2	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1.Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Tutorials		00
Practical Work		60
1. Course Laboratory	60	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination		12
Total Duration in Hours		**72**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component(CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical Record, viva voce, etc.	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1			X	X
CO-2			X	X
CO-3			X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Practical Record and Regular Viva voce: 03 Marks

1C. Sessional exam: Two tests (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination.

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by the course leader and external examiner.

Re-assessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean- Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to re-sit for examination (Supplementary examination).
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall appear for the Supplementary examination.
3. The maximum number of such opportunities is limited and as per the academic regulations governing this programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Sl.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	Course Laboratory/work
7.	Group Work	Course Laboratory/work
8.	Self-Learning	Course Laboratory/work
9.	Written Communication Skills	Course Laboratory/work
10.	Verbal Communication Skills	Course Laboratory/work
11.	Presentation Skills	Course Laboratory/work
12.	Behavioral Skills	Course Laboratory/work
13.	Information Management	Course Laboratory/work
14.	Personal Management	Course Laboratory/work
15.	Leadership Skills	Group work

9. Course Resources

f. Class Notes

g. Essential Reading

1. Gokhale, S.B and Kokate, C.K. (2008) Practical Pharmacognosy. 12th ed. Pune: Nirali Prakashan
2. Iyengar, M.A. (2012) Study of Crude Drugs. 15th ed. Manipal: Manipal Power Press.
3. WHO Report. (1991) Guidelines for the Assessment of Herbal Medicines. Geneva.

h. Recommended Reading

1. Kokate, C.K., Purohit, A.P. and Gokhale, S.B., (2010) Pharmacognosy. 45th ed. Pune: Nirali Prakashan.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. Rangari, V.D. (2008) Pharmacognosy and Phytochemistry. Vol II. Nasik: Career Publications.

i. Magazines and Journals

1. Indian Journal of Natural Products and resources - NISCAIR, New Delhi
2. Journal of Natural Remedies - Informatics Publishing Limited, New Delhi

e. Websites

1. www.pubmed.com
2. Herbnet.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 5

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Medicinal Chemistry-II (Theory)

Course Title	Medicinal Chemistry-II Theory
Course Code	BPC341
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. This course emphasizes on structure activity relationships of drugs and chemical synthesis of certain drugs.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Classify medicinal compounds based on their chemical structures

CO-2 Explain the mechanism of action, therapeutic uses and adverse effects of drugs

CO-3 Discuss the synthesis of selected drugs based on principles of synthetic chemistry

CO-4 Interpret the structure–activity relationship (SAR) of different drug classes

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

Unit 1

Antihistaminic agents: Histamine, receptors, and their distribution in the human body

H1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H2-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Mecloréthamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane.

10 Hours

Unit 2

Anti-anginal:

Vasodilators: Amyl nitrite, Nitro-glycerine*, Pentaerythritol tetranitrate, Isosorbide dinitrate*, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics:

Carbonic anhydrase Inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride*, Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

10 Hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean- Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 3

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

10 Hours

Unit 4

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandrolone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol

Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

08 Hours

Unit 5

Antidiabetic agents:

Insulin and its preparations

Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acrabose, Voglibose.

Local Anaesthetics: SAR of Local anaesthetics

Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Diperodon, Dibucaine*.

07 Hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		1								1	2	
CO-2	3											2	
CO-3	3											2	
CO-4	3		2								1	3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities is limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class Notes**

b. **Essential Reading**

1. Block, JH. (2011) Wilson and Gisvold's Textbook of Organic, Medicinal and Pharmaceutical Chemistry, 13th edition, New York, Philadelphia: Lippincott-Raven Publishers.
2. William, DA. (ed.) (2002) Foye's Principles of Medicinal Chemistry, 5th edition, New York, Philadelphia: Lippincott-Raven Publishers.
3. Abraham, DJ. (ed.) (2003) Burger's Medicinal Chemistry and Drug Discovery - Vol. 1 to 6, 5th Edition, New York: John Wiley and Sons Inc.
4. Lednicer, D. (2007) Organic Chemistry of Drug Synthesis (Vol. I and II); USA: Wiley-Interscience.

c. **Recommended Reading**

5. Loyd, VA. (2013) Remington - The Science and Practice of Pharmacy - Vol. 1 and 2, 22nd Edition, Easton, Pennsylvania: MACK Publishing Company.
6. Patrick, GL. (2009). An Introduction to Medicinal Chemistry. 2nd Edition. UK: Oxford

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

University Press.

d. Magazines and Journals

1. Indian Journal of Chemistry Section – B, New Delhi: CSIR – NISCAIR Publications.
2. European Journal of Medicinal Chemistry, Amsterdam, Netherlands: Elsevier.
3. Indian Journal of Pharmaceutical Sciences, OMICS International on behalf of the Indian Pharmaceutical Association (India).

e. Websites

1. www.cimsasia.com/india
2. www.newdruginfo.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Industrial Pharmacy I Theory

Course Title	Industrial Pharmacy I Theory
Course Code	BPC342
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course deals with the pre-formulation considerations and designing of dosage forms. This course imparts knowledge on physico-chemical principles of dosage form designing. The course also aims to introduce students to the science of packaging design and prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the pre-formulation considerations in designing dosage forms
- **CO-2** Design and develop stable pharmaceutical dosage forms with appropriate ingredients, labeling, and storage conditions
- **CO-3** Evaluate the quality and stability of pharmaceutical dosage forms and cosmetics as per official standards and recommend suitable corrective measures
- **CO-4** Design suitable packaging for pharmaceutical dosage forms and cosmetic preparations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 (Pre-formulation Studies): Introduction to pre-formulation, goals and objectives, study of physicochemical characteristics of drug substances.
a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism
b. Chemical Properties: Hydrolysis, oxidation, reduction, racemization, polymerization
BCS classification of drugs & its significant
Application of pre-formulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms. **07 hours**

Unit 2 (Tablets):
a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.
c. Quality control tests: In process and finished product tests

Liquid orals:
Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

10 hours

Unit 3 (Capsules):
a. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.
b. Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets:
Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets.

08 hours

Unit 4 (Parenteral Products):
a. Definition, types, advantages and limitations. Pre-formulation factors and essential requirements, vehicles, additives, importance of isotonicity
b. Production procedure, production facilities and controls, aseptic processing
c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.
d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations:
Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

10 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 5 (Cosmetics):
Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.
Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.
Packaging Materials Science:
Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

10 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3									3	
CO-2			3			2	2					3	
CO-3			3			2	2					3	
CO-4			2									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

a. **Class Notes**

b. **Essential Reading**

1. Leon Lachmann, Herbert A Liebermann. (2009) The Theory and Practice of Industrial Pharmacy. 1st Edition. New Delhi: CBS Publishers.
2. Aulton, ME. (2001) Pharmaceutics: The Science of Dosage Form Design. 2nd Edition. Edinburgh: Churchill Livingstone.
3. Banker, Rhodes. (1990) Modern Pharmaceutics. 2nd Edition. New York: Marcel Decker Inc.
4. Howard C Ansel, Loyd Allen. (2013) Ansel's Pharmaceutical Dosage form and Drug delivery system. 10th Edition. New Delhi: Lippincott Williams and Wilkins.
5. Leon Lachmann, Herbert A Liebermann. (1989) Pharmaceutical Dosage Forms- Tablets. 2nd Edition. New York: Marcel Decker Inc.
6. Leon Lachmann, Herbert A Liebermann. (1989) Pharmaceutical Dosage Forms- Parenteral Medication. 2nd Edition. New York: Marcel Decker Inc.

c. **Recommended Reading**

1. Bharath S. (2012) Pharmaceutics- Formulations and Dispensing Pharmacy. 1st Edition. Asia: Pearson Publishers.
2. Alfonso R Gennaro. (2012) Remington: The Science and Practice of Pharmacy, Vol- I and Vol-II 22nd Edition. New Delhi: Lippincott Williams and Wilkins.
3. Carter S J. (2008) Cooper and Gunn's-Dispensing for Pharmaceutical students. 12th Edition. New Delhi: CBS Publishers.
4. Latest Editions of British Pharmacopoeia, United States Pharmacopoeia, Extra Pharmacopoeia, British Pharmaceutical Codex.

d. **Magazines and Journals**

1. Indian Journal of Pharmaceutical Sciences.
2. International Journal of Pharmaceutical Sciences.

e. **Websites**

1. www.americanpharmaceuticalreview.com
2. www.pharmamanufacturing.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacology-II Theory

Course Title	Pharmacology-II Theory
Course Code	BPC343
Course Type	Core Theory
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate students on drugs and their actions on the human body and their therapeutic applications. This course facilitates students to gain better understanding on pharmacodynamics and pharmacokinetics of drugs and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Discuss and interpret the principles, methodologies, and applications of various bioassay techniques.
CO-2 Explain and integrate pharmacokinetic processes with mechanisms of drug action at organ, cellular, and molecular levels.
CO-3 Analyze the pharmacological actions of drugs acting on different physiological systems.
CO-4 Evaluate adverse drug reactions and drug–drug interactions with respect to their mechanisms and clinical significance.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Pharmacology of drugs acting on cardio vascular system
a. Introduction to hemodynamic and electrophysiology of heart
b. Drugs used in congestive heart failure
c. Anti-hypertensive drugs
d. Anti-anginal drugs
e. Anti-arrhythmic drugs
f. Anti-hyperlipidemic drugs **10 hours**

Pharmacology of drugs acting on cardio vascular system
a. Drug used in the therapy of shock
b. Hematinics, coagulants and anticoagulants
c. Fibrinolytics and anti-platelet drugs
d. Plasma volume expanders

Pharmacology of drugs acting on urinary system
a. Diuretics and
b. Anti-diuretics **10 hours**

Autocoids and related drugs
a. Introduction to autacoids and classification
b. Histamine, 5-HT and their antagonists
c. Prostaglandins, Thromboxanes and Leukotrienes.
d. Angiotensin, Bradykinin and Substance P
e. Non-steroidal anti-inflammatory agents
f. Anti-gout drugs
g. Anti-rheumatic drugs **10 hours**

Pharmacology of drugs acting on endocrine system
a. Basic concepts in endocrine pharmacology
b. Anterior Pituitary hormones- analogues and their inhibitors
c. Thyroid hormones- analogues and their inhibitors
d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D
e. Insulin, Oral Hypoglycemic agents and glucagon
f. ACTH and corticosteroids **08 hours**

Pharmacology of drugs acting on endocrine system
a. Androgens and Anabolic steroids
b. Estrogens, progesterone and oral contraceptives
c. Drugs acting on the uterus.

Bioassay
a. Principles and applications of bioassay.
b. Types of bioassay
c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine & 5-HT **07 hours**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean -Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		3										3	
CO-2		3										3	
CO-3			3									3	
CO-4				2								3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean- Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, and SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Rang, M.P., Dale, M.M. and Riter, J.M. (2015) Pharmacology.8th edn. China: Churchill Livingstone.
2. Katzung, B. G. (2009) Basic and Clinical Pharmacology.11th edn. NewDelhi: Tata Mc Graw Hill.
3. Tripathi, K.D. (2013) Essentials of Medical Pharmacology.7th edn. New Delhi: Jaypee Brothers.
4. Sharma, H. L. and Sharma, K. K. (2011) Principles of Pharmacology. 2nd edn. New Delhi: Paras Publishing.

c. Recommended Reading

1. Rang, M. P., Dale, M. M. and Riter, J.M. (2015) Pharmacology. 8th edn. China: Churchill Livingstone.
2. Katzung, B.G. (2009) Basic and Clinical Pharmacology.11th edn. New Delhi: Tata McGraw Hill.
3. Goodman, L. S., Gilman, A., Brunton, L. L., Lazo, J. S. and Parker, K. L.(ed.) (2011) Goodman and Gilman's The Pharmacological Basis of Therapeutics. 12th edn. New York: McGraw Hill Education.
4. Marry Anne, K. K., Lloyd Yee, Y., Brian, K. A., Robbin, L.C., Joseph, G. B., Wayne, A. K., Bradley, R.W. (2011) Applied Therapeutics, The Clinical use of Drugs. 10th edn. USA: Lippincott Williams & Wilkins.
5. Michelle, A. C., Richard, F., Jose, A. R. and Karen, W. (ed.) (2011) Lippincott's Illustrated Reviews Pharmacology. 5th edn. China: Lippincott Williams & Wilkins.
6. Tripathi, K.D. (2013) Essentials of MedicalPharmacology.7th edn. New Delhi: Jaypee Brothers.
7. Sharma, H. L. and Sharma, K. K. (2011) Principles of Pharmacology. 2nd edn. New Delhi: Paras Publishing.
8. Stitzel, R. E., Craig, C. R. (2012) Modern Pharmacology with Clinical Applications. 6th edn. USA: Lippincott Williams & Wilkins.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9. Ghosh, M. N. (2008) Fundamentals of Experimental Pharmacology. 6th edn. Kolkata: Hilton & Company.
10. Kulkarni, S. K. (2010) Handbook of Experimental Pharmacology. 3rd edn. Delhi: Vallabh Prakashan.

d. Magazines and Journals

1. Indian Journal of Pharmacology
2. Journal of Pharmacy and Pharmacology
3. Indian Drugs
4. Drug USA
5. ICH, OECD and USFDA Guidelines

e. Websites

1. www.icp.org.nz
2. www.craigslist.org
3. www.druglib.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacognosy and Phytochemistry-II (Theory)

Course Title	Pharmacognosy and Phytochemistry-II Theory
Course Code	BPC344
Course Type	Core Theory
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart knowledge on the basics of phytochemistry and secondary metabolites present in plants. It imparts knowledge on the isolation of phytoconstituents, their basic metabolic pathways, analysis and industrial production.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and Interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the metabolic pathways involved in the production of primary and secondary metabolites
- **CO-2** Outline the source, chemistry and commercial applications of secondary metabolites
- **CO-3** Apply suitable methods for isolation, industrial production, identification and estimation of phytoconstituents
- **CO-4** Discuss phytochemical aspects related to extraction and various analytical techniques

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramyuth-K.V.
Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 (Metabolic pathways in higher plants and their determination): Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway, Biosynthesis of cardiac glycosides, Saponin glycosides, opium, cinchona, Vinca, ergot alkaloids and quercetin. Study of utilization of radioactive isotopes in the investigation of Biogenetic studies. **7 hours**

Unit 2 (Introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites): Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, Withania, cinchona, ergot. Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta, Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis, Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, Tannins: Catechu, Pterocarpus, Nutgall, Myrobalan. Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony, Glycosides: Senna, Aloes, Bitter Almond, Ginseng. Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids. **14 hours**

Unit 3 (Isolation, Identification and Analysis of Phytoconstituents): Terpenoids: Menthol, Citral, Artemisin, Glycosides: Glycyrrhetinic acid & Rutin, Alkaloids: Atropine, Quinine, Reserpine, Caffeine, Resins: Podophyllotoxin, Curcumin. **6 hours**

Unit 4 (Industrial production, estimation and utilization of the following phytoconstituents): Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine. **10 hours**

Unit 5 (Basics of Phytochemistry): Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs. **8 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											2	
CO-2	2											2	2
CO-3				3									2
CO-4	3												2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		60
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Numeracy		00
1. Solving Numerical Problems	00	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	75 Marks
Maximum Marks	4	6	15	
CO-1			×	×
CO-2		×	×	×
CO-3			×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 or SC4 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.
Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Classroom lectures, Self-study
3.	Critical Skills	Assignment
4.	Analytical Skills	Assignment
5.	Problem Solving Skills	Assignment, Examination
6.	Practical Skills	Assignment
7.	Group Work	--
8.	Self-Learning	Self-study
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	--
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

9. Course Resources

a. Class notes

b. Essential Reading

1. Evans, W.C. (2009) *Trease and Evans Pharmacognosy*. 16th ed. New Delhi: Saunders Elsevier: Elsevier India Pvt Ltd.
2. Kokate, C.K, Purohit A.P and Gokhale, S.B. (2010) Pharmacognosy. 45th ed. Pune: Nirali Prakashan.
3. Tyler, V.E. and Brady, R. (1998) *Pharmacognosy*. 9th ed. Philadelphia: Lea and Febiger.
4. Wallis, TE. (1985) *Textbook of Pharmacognosy*. 5th ed. New Delhi: CBS Publishers and Distributors.
5. Beckett, A.H and Stenlake, J.B. (2004) *Practical Pharmaceutical Chemistry*. Part I and II. 4th ed. New Delhi: CBS Publishers and Distributors.
6. Rangari, V.D. (2003) *Pharmacognosy and Phytochemistyr*.1st ed. Nashik: Career Publications.

c. Recommended Reading

1. Jain, R.P., 2010, Modern Digital Electronics, 3rd Ed., Tata McGraw-Hill.
2. Floyd, T.L., 2007, Digital Fundamentals, 8th Ed., Pearson Education.
3. Ananda Kumar, A., 2009, Switching Theory and Logic Design, Prentice Hall of India.

d.Magazines and Journals

1. Pharmacognosy Magazine - Phcog.Net, Bangalore

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

2. Journal of Natural products – ACS Publications, Washington
3. Indian Journal of Natural Products and Resources – NISCAIR, New Delhi.

e.Websites

1. www.phcognet.com
2. Herbnet.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Jurisprudence (Theory)

Course Title	Pharmaceutical Jurisprudence Theory
Course Code	BPC345
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to introduce the origin and legislations with various acts related to the profession of pharmacy in India. This course emphasizes the latest developments in worldwide drug regulations and prepares students for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the importance of pharmaceutical ethics and professional responsibilities
- **CO-2** Summarize and interpret provisions of pharmaceutical acts and regulations
- **CO-3** Apply regulatory concepts including price fixation and labeling requirements
- **CO-4** Evaluate implications of pharmaceutical laws and latest amendments in professional practice

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

4. Course Contents

Unit 1 (Drugs and Cosmetics Act, 1940 and its rules 1945):

a. Objectives, Definitions, Legal definitions of schedules tothe Act and Rules.
b. Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.
c. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs. Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license

10 hours

Unit 2 (Drugs and Cosmetics Act, 1940 and its rules 1945):

a. Drugs and Cosmetics Act, 1940 and its rules 1945.Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)
b. Sale of drugs – Wholesale, Retail sale and restricted license. Offences and penalties
c. Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.
d. Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, licensing authorities, controlling authorities, Drugs Inspectors

10 hours

Unit 3

Pharmacy Act:

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and penalties

Medicinal and Toilet Preparation Act –1955:

Objectives, Definitions, Licensing, Manufacture in bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent &Proprietary Preparations. Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules:

Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

10 hours

Unit 4

Drugs and Magic Remedies Act and its rules:

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

Prevention of Cruelty to animals Act-1960:

Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO) - 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560 054

08 hours

Unit 5

Pharmaceutical Legislations -- A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee

Code of Pharmaceutical ethics Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath

Medical Termination of Pregnancy Act
Right to Information Act
Introduction to Intellectual Property Rights (IPR)

07 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3					3	3		2			2	1
CO-2						3	3				3	2	2
CO-3							3		3		3	3	2
CO-4							3		3		3	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		01
1.Demonstration using Videos	01	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		04

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. Case Study Presentation	02	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	02	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1			X	X
CO-2			X	X
CO-3			X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. B. Suresh. (2011). *Forensic Pharmacy*. Birla Publications Pvt.Ltd. Delhi
2. M.L. Mehra. (2005), *Hand Book of Drug Law*. Universal Book Agency, Allahabad
3. Jain N K. (2003) *A Text Book of Forsenic Pharmacy*. 6th Ed. New Delhi: Vallabh Prakashan.
4. Drugs and Cosmetics Act/Rules by Govt. of India publications.
5. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
6. Narcotic drugs and psychotropic substances act by Govt. of India publications
7. Drugs and Magic Remedies act by Govt. of India publication
8. Mittal B.M. (2013) *A Text Book of Forsenic Pharmacy*. New Delhi: Vallabh Prakashan

c. Recommended Reading

1. Agarwal S P., Rajesh Khanna. (2014) Pharmaceutical Jurisprudence & Ethics – Forensic Pharmacy. 5th Ed. New Delhi:Birla Publications.
2. Bharati H K. (1984) A manual of drugs and Pharmacy Laws in India. 2nd Ed. Indore: Sadhana Mandir.
3. Latest issues of CIMS, MIMS, PDR, DDR.
4. Latest issues of IDMA Bulletin.
5. CPSCEA Guidelines.

d. Magazines and Journals

Indian Drugs, Indian Drug Manufacturers' Association (IDMA), Mumbai

e. Websites

1. www.cdsco.org
2. www.usfda.gov.in

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Industrial Pharmacy I Practical

Course Title	Industrial Pharmacy I Practical
Course Code	BPL346
Course Type	Core Practical
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to train students on formulation and evaluation of different pharmaceutical dosage forms through a series of experiments. The student will be trained to correlate the physicochemical properties of drugs and excipients to the dosage form characteristics to obtain a stable formulation.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Lab Interaction during semester	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks 1B: Sessional Exam: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Justify how the physicochemical properties of drugs influence the design and performance of appropriate dosage forms

CO-2 Design and develop stable pharmaceutical dosage forms with appropriate ingredients, labeling, and storage conditions

CO-3 Evaluate the quality and stability of pharmaceutical dosage forms and cosmetics as per official standards

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

1. Pre-formulation studies on paracetamol/aspirin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsule
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Quality control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)
12. Dissolution studies of uncoated tablets

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3								2		3
CO-2			3			3		3			3		3
CO-3			3			3		3			3		
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Practical Work		55
1. Course Laboratory	55	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	00
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% weightage)			**Component 2: SEE (70% weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance***	**Practical Record, Viva -Voce etc.**	**Sessional Exam***	**Semester End Practical Examination 35 Marks***
Maximum Marks	**2**	**3**	**10**	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1*: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-54

1A: The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Practical	
Attendance (Refer Table below)	2
Practical Records, Regular viva voce etc.	3
Total	5

Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1 B: Practical and Regular viva voce – 03 Marks

1C. Sessional exam: Two tests (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination

Component - 2*: 35 marks
A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory reports
10.	Verbal Communication Skills	Regular assessment and Viva voce
11.	Presentation Skills	Laboratory reports
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory Reports
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Leon Lachmann, Herbert A Liebermann. (2009) The Theory and Practice of Industrial Pharmacy. 1st Edition. New Delhi: CBS Publishers.
2. Aulton, ME. (2001) Pharmaceutics: The Science of Dosage Form Design. 2nd Edition. Edinburgh: Churchill Livingstone.
3. Banker, Rhodes. (1990) Modern Pharmaceutics. 2nd Edition. New York: Marcel Decker Inc.
4. Howard C Ansel, Loyd Allen. (2013) Ansel's Pharmaceutical Dosage form and Drug delivery system. 10th Edition. New Delhi: Lippincott Williams and Wilkins.
5. Leon Lachmann, Herbert A Liebermann. (1989) Pharmaceutical Dosage Forms- Tablets. 2nd Edition. New York: Marcel Decker Inc.
6. Leon Lachmann, Herbert A Liebermann. (1989) Pharmaceutical Dosage Forms- Parenteral Medication. 2nd Edition. New York: Marcel Decker Inc.

b. Recommended Reading

1. Bharath S. (2012) Pharmaceutics- Formulations and Dispensing Pharmacy. 1st Edition. Asia: Pearson Publishers.
2. Alfonso R Gennaro. (2012) Remington: The Science and Practice of Pharmacy, Vol- I and Vol-II 22nd Edition. New Delhi: Lippincott Williams and Wilkins.
3. Carter S J. (2008) Cooper and Gunn's-Dispensing for Pharmaceutical students. 12th Edition. New Delhi: CBS Publishers.
4. Latest Editions of British Pharmacopoeia, United States Pharmacopoeia, Extra

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Pharmacopoeia, British Pharmaceutical Codex.

c. Magazines and Journals

1. Indian Journal of Pharmaceutical Sciences.
2. International Journal of Pharmaceutical Sciences.

d. **Websites**

1. www.science direct.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacology II Practical

Course Title	Pharmacology II Practical
Course Code	BPL347
Course Type	Core Practical
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to provide training on drug evaluation using animal as well as simulation models to acquire research skills and prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	50 **Component 1:** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Demonstrate and perform in-vitro and in-vivo pharmacological experiments using isolated tissues and animal models to study drug effects.
- **CO-2** Analyze dose–response relationships, bioassay methods, and pharmacological parameters (e.g., DRC, pA_2, pD_2) for evaluation of drug potency and efficacy.
- **CO-3** Interpret experimental data to evaluate pharmacological actions such as cardiovascular effects, smooth muscle responses, anti-inflammatory and analgesic activities of drugs.

4. Course Contents

1. Introduction to in-vitro pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three-point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four-point bioassay.
11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software and videos

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3					2						3	
CO-2		3	2									3	
CO-3				3							2	3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		00
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, and SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Marks**
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35 and evaluated by concerned course leader and External examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Class Notes

b.Essential Reading

1. Kulkarni, S.K. (1999) Hand Book of Experimental Pharmacology, 3rd edn, New Delhi: Vallabh Prakashan
2. Ghosh, M.N. (2008) Elements of Experimental Pharmacology, 4th edn, Kolkata: Hilton and Company
3. Goyal, R.K. (2000) Practicals in Pharmacology, 2nd edn, Ahmedabad: BS Shah Prakashan.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Vrushabendra Swamy, B.M., Jayaveera, K.N. and Venkateshwar Reddy, A. (2014) Experimental Pharmacology and Toxicology, New Delhi: Chand and Company Pvt. Ltd.

c. Recommended Reading

1. Vogel, H.G. (2002) Drug discovery and evaluation. 2nd edn. New York: Springer.
2. Parmer, N.S. and Prakash, S. (2006) Screening Methods in Pharmacology, New Delhi: Narosa Publishing House.
3. Turner, R.A. (1965) Screening Methods in Pharmacology, New York: Academic Press.

d.Magazines and Journals

1. Indian Journal of Pharmacology
2. Journal of Pharmacology and Experimental Therapeutics
3. European journal of Pharmacology
4. British Journal of Pharmacology

e.Websites

1. www.icp.org.nz
2. www.craigslist.org
3. www.druglib.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacognosy and Phytochemistry-II Practical

Course Title	Pharmacognosy and Phytochemistry-II Practical
Course Code	BPL348
Course Type	Core Practical
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart training on identification of crude drugs by macroscopical and microscopical characteristics. Students are trained to perform isolation and identification of phytoconstituents using chromatographic techniques.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	50 **Component 1(IA): 15 Marks** 1A: Attendance: 02 Marks 1B: Practical Record, Viva voce: 03 marks 1C: Sessional Exam: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Identify crude drugs by morphology, histology, powder characteristics, and chemical tests
- **CO-2** Isolate and identify phytoconstituents from crude drugs
- **CO-3** Apply chromatographic techniques for the separation and identification of plant metabolites

4. Course Contents

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel, Coriander, Rauwolfia and Nuxvomica
2. Exercise involving isolation & detection of active principles
   a. Caffeine - from tea dust, b. Diosgenin from Dioscorea, c. Atropine from Belladonna, d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Distillation of volatile oils and detection of phytoconstituents by TLC
6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		3	3					2				2	
CO-2		3	3					2				2	
CO-3		3	3					2			3		3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		00
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
		00
1. Solving Numerical Problems		
Practical Work		60
1. Course Laboratory	60	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination		12
Total Duration in Hours		**72**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical Record, viva voce, etc.	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1			×	×
CO-2			×	×
CO-3			×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

1A: The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Practical	
Attendance (Refer Table below)	2
Practical Records, Regular viva voce etc.	3
Total	5

Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1 B: Practical and Regular viva voce – 03 Marks

1C. Sessional exam: Two tests (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination

Component-2: 35 marks
A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

7. Re assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	Course Laboratory/work
7.	Group Work	Course Laboratory/work
8.	Self-Learning	Course Laboratory/work
9.	Written Communication Skills	Course Laboratory/work
10.	Verbal Communication Skills	Course Laboratory/work
11.	Presentation Skills	Course Laboratory/work
12.	Behavioral Skills	Course Laboratory/work
13.	Information Management	Course Laboratory/work
14.	Personal Management	Course Laboratory/work
15.	Leadership Skills	Group work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9. Course Resources

a.Essential Reading

1. Harborne, JB. (1998) *Phytochemical Methods - A Guide to Modern Techniques of Plant Analysis.* 3rd ed. London: Chapman and Hall.
2. Iyengar, M.A. (1997) *Pharmacognosy of Powdered Drugs*. 5th ed. Manipal: Manipal Power Press.
3. Iyengar, M.A. (2012) *Study of Crude Drugs*. 15th ed. Manipal: Manipal Power Press.
4. Gokhale, S.B and Kokate, C.K. (2008) *Practical Pharmacognosy*. 12th ed. New Delhi: Nirali Prakashan.
5. Iyengar, M.A and Nayak, S.G.K. (2011) *Anatomy of Crude Drugs*. 12th ed. Manipal: Manipal Power Press. Publications

b. Recommended Reading

1. Rangari, V.D. (2008) *Pharmacognosy and Phytochemistry*. Vol I and II. Nasik: Career Publication

c. Magazines and Journals

1. Pharmacognosy Magazine - Phcog.Net, Bangalore.
2. Journal of Natural products – ACS Publications, Washington
3. Indian Journal of Natural Products and Resources – NISCAIR, New Delhi.

d. Websites

1. www.phcognet.com
2. Herbnet.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 6

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Medicinal Chemistry III Theory

Course Title	Medicinal Chemistry III Theory
Course Code	BPC349
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

This course deals with aspects of Medicinal Chemistry. This course emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The course also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Classify medicinal compounds based on their chemical structure and outline their structural features and synthesis

CO-2 Explain the mode of action, metabolism, adverse effects and therapeutic uses of drugs

CO-3 Discuss the relationship between the structural features of drug molecules with their biological activity

CO-4 Explain principle and techniques involved in drug design

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

Unit 1

Antibiotics: **10 hours**

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

Unit 2

Antibiotics: **10 hours**

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine. Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil. Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

Unit 3 **10 hours**

Anti-tubercular Agents:

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid. *

Anti-tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycin, Capreomycin sulphate.

Urinary tract anti-infective agents:

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirdine, Ribavirin, Saquinavir, Indinavir, Ritonavir.

08 hours

Unit 4

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents:
Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine, Isethionate, Atovaquone, Eflornithine.

Anthelmintics:
Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

Sulphonamides and Sulfones
Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors:
Trimethoprim*, Cotrimoxazole, Sulfones: Dapsone*.

Unit 5 **07 hours**

Introduction to Drug Design
Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques.
Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3												
CO-2	1											2	
CO-3	1		2									2	
CO-4	1										2	1	1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	-	
3. Demonstration on a Computer	2	
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			x	x
CO-2			x	x
CO-3			x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

1. Class Notes
2. Williams DA. (ed.) (2002) Foye's Principles of Medicinal Chemistry. 5th Edition. Philadelphia: Lippincott.
3. Doerge, RF. (ed.) (1982) Text Book of Organic Medicinal and Pharmaceutical Chemistry. 8th Edition. Toronto: Lippincott.
4. Lednicer, D. (2007) Organic Chemistry of Drug Synthesis (Vol. I and II); USA: Wiley-Inter science.
5. Wilson C, Gisvold O. Text Book of Organic Medicinal and Pharmaceutical Chemistry. 12th Edition. Toronto, Canada: J. B. Lippincott.
6. D. J. Abraham (ed.) Burger's Medicinal Chemistry and Drug Discovery. New York: John Wiley and Sons Inc.

b. Recommended Reading

1. Smith and Williams' (ed.) Introduction to the Principles of Drug Design and Action. 4th Edition, USA:

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

CRC press.
2. Remington (2012). The Science and Practice of Pharmacy. 22nd Edition. New York: Lippincott, Williams and Wilkins.
3. Latest Editions of British Pharmacopoeia, United States Pharmacopoeia, Extra Pharmacopoeia, British Pharmaceutical Codex, Martindale, and Merck Index
4. Finar IL. (2002) Stereochemistry and the Chemistry of Natural Products, 5th Edition Vol2,India: Pearson Education (Singapore), Indian branch
5. Indian Pharmacopoeia. New Delhi: Government of India. Ministry of Health and Family Welfare, Govt. of India. (2010) 6th Edition. Ghaziabad: Indian Pharmacopoeia Commission.
6. Vogel, AI. and Furniss, BS. (1989) Textbook of Practical Organic Chemistry. 4th Edition. London: ELBS Longman

c.Magazines and Journals

1. Indian Journal of Chemistry Section –B. New Delhi: Niscair.
2. European Journal of Medicinal Chemistry. Amsterdam: Elsevier.
3. Indian Journal of Pharmaceutical Sciences. Mumbai: IPA.

d. Websites

1. www.chemtube3d.com
2. www.organic-chemistry.org
3. www.rsc.org

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacology – III Theory

Course Title	Pharmacology – III Theory
Course Code	BPC350
Course Type	Core Theory
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate students on drugs action and how their effects can be applied to therapeutics. This course facilitates students to gain better understanding on pharmacodynamics and pharmacokinetics of drugs and to prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the pharmacology of drugs acting on the respiratory system and gastrointestinal tract

CO-2 Analyze the general principles, classification, pharmacology, clinical applications and resistance patterns of antimicrobial agents

CO-3 Discuss the pharmacology of anticancer agnts, immunopharmacological and the management of UTI and STDs

CO-4 Apply the principles of toxicology and chronopharmacology to evaluate drug safety and recognize poisoning symptoms

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1. I. Pharmacology of drugs acting on Respiratory system
a. Anti -asthmatic drugs
b. Drugs used in the management of COPD
c. Expectorants and antitussives
d. Nasal decongestants
e. Respiratory stimulants

II. Pharmacology of drugs acting on the Gastrointestinal Tract
a. Antiulcer agents.
b. Drugs for constipation and diarrhoea.
c. Appetite stimulants and suppressants.
d. Digestants and carminatives.
e. Emetics and anti-emetics.

10 hours

Unit 2. Chemotherapy
a. General principles of chemotherapy.
b. Sulfonamides and cotrimoxazole.
c.Antibiotics - Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

10 hours

Unit 3. Chemotherapy
a. Antitubercular agents
b. Antileprotic agents
c. Antifungal agents
d. Antiviral drugs
e. Anthelmintics
f. Antimalarial drugs
g. Antiamoebic agents

10 hours

Unit 4: I. Chemotherapy
a. Urinary tract infections and sexually transmitted diseases.
b. Chemotherapy of malignancy

II. Immunopharmacology
a. Immunostimulants
b. Immunosuppressant- Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars.

08 hours

Unit 5: I. Principles of toxicology
a. Definition and basic knowledge of acute, subacute and chronic toxicity.
b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
c. General principles of treatment of poisoning
d. Clinical symptoms and management of barbiturates, morphine, organo-phosphorus compounds, lead, mercury and arsenic poisoning.

II. Chronopharmacology
a. Definition of rhythm and cycles

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

b. Biological clock and their significance leading to chronotherapy.

07 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2	3		3									3	
CO-3	3								3		2	3	
CO-4	3		3								3		3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	–
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Rang,M.P., Dale,M.M. and Riter, J.M. (2015) Pharmacology.8th edn. China: Churchill Livingstone.
2. Katzung, B. G. (2009) Basic and Clinical Pharmacology.11th edn.NewDelhi:Tata McGrawHill.
3. Tripathi, K.D. (2013) Essentials of Medical Pharmacology.7th edn. New Delhi: Jaypee Brothers.
4. Sharma, H. L. and Sharma, K. K. (2011) Principles of Pharmacology. 2nd edn. New Delhi: Paras Publishing.

c. Recommended Reading

1. Rang, M. P., Dale, M. M. and Riter, J.M. (2015) Pharmacology. 8th edn. China: Churchill Livingstone.
2. Katzung, B.G. (2009) Basic and Clinical Pharmacology.11th edn. New Delhi: Tata McGraw Hill.
3. Goodman, L. S., Gilman, A., Brunton, L. L., Lazo, J. S. and Parker, K. L.(ed.) (2011) Goodman and Gilman's The Pharmacological Basis of Therapeutics. 12th edn. New York: McGraw Hill Education.
4. Marry Anne, K. K., Lloyd Yee, Y., Brian, K. A., Robbin, L.C., Joseph, G. B., Wayne, A. K., Bradley, R.W. (2011) Applied Therapeutics, The Clinical use of Drugs. 10th edn., USA: Lippincott Williams & Wilkins.
5. Michelle, A. C., Richard, F., Jose, A. R. and Karen, W. (ed.) (2011) Lippincott's Illustrated Reviews Pharmacology. 5th edn. China: Lippincott Williams & Wilkins.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Tripathi, K.D. (2013) Essentials of MedicalPharmacology.7th edn. New Delhi: Jaypee Brothers.
7. Sharma, H. L. and Sharma, K. K. (2011) Principles of Pharmacology. 2nd edn. New Delhi: Paras Publishing.
8. Stitzel, R. E., Craig, C. R. (2012) Modern Pharmacology with Cinical Applications. 6th edn. USA; Lippincott Williams & Wilkins.
9. Ghosh, M. N. (2008) Fundamentals of Experimental Pharmacology. 6th edn. Kolkata: Hilton & Company.
10. Kulkarni, S. K. (2010) Handbook of Experimental Pharmacology.3rd edn. Delhi: Vallabh Prakashan.

d. Magazines and Journals

1. Indian Journal of Pharmacology
2. Journal of Pharmacy and Pharmacology
3. Indian Drugs
4. Drug USA
5. ICH, OECD and USFDA Guidelines

e. Websites

1. www.icp.org.nz
2. www.craigslist.org
3. www.druglib.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Herbal Drug Technology Theory

Course Title	Herbal Drug Technology Theory
Course Code	BPC351
Course Type	Core Theory
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

This course is designed to impart fundamental knowledge on herbal drug industry, various herbal formulations and cosmetics including nutraceuticals. It also emphasizes on Good Manufacturing Practices (GMP); patenting and regulatory issues of herbal drugs; Herbal-Drug and Herb-Food Interactions.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	70
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	100 Marks **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain herbal raw materials, identification, processing, and cultivation principles
- **CO-2** Summarize nutraceuticals, therapeutic benefits, and herb-drug interactions
- **CO-3** Discuss herbal formulations, cosmetics, excipients, and traditional medicines
- **CO-4** Elaborate regulations, quality control, patents, and herbal industry practices

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1(Herbs as raw materials):

a. Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs, Selection, identification and authentication of herbal materials, Processing of herbal raw material

b. Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming, Pest and Pest management in medicinal plants, Biopesticides/Bioinsecticides.

c. Indian Systems of Medicine

Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy, Preparation and standardization of Ayurvedic formulations vizAristas and Asavas, Ghutika, Churna, Lehya and Bhasma. **11 Hours**

Unit 2 (Nutraceuticals):

a. General aspects, Market, growth, scope and types of products available in the market, Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

b. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

c. Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification, Study of following drugs and their possible side effects and interactions- Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra. **7 hours**

Unit 3:

a. Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

b. Herbal excipients: Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

c. Herbal formulations: Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes **10 hours**

Unit 4:

a. Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs, stability testing of herbal drugs.

b. Patenting and Regulatory requirements of natural products:

Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bio prospecting and Biopiracy,

Patenting aspects of Traditional Knowledge and Natural Products, Case study of Curcuma and Neem.

c. Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs. **10 hours**

Unit 5:

a. General Introduction to Herbal Industry

Herbal drugs industry-Present scope and future prospects, a brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

b. Schedule T – Good Manufacturing Practice of Indian systems of medicine

Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

7 Hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2	3											3	
CO-3	3											2	
CO-4						3			3				3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		05
Total Duration in Hours		**65**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.
Both components will be evaluated by concerned course leader/s.

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class Notes**
b. **Essential Reading**

1. Evans, W.C. (2009)*Trease and Evans Pharmacognosy*.16th ed. New Delhi: Saunders Elsevier: Elsevier India Pvt Ltd.
2. Kokate,C.K.,Purohit,A.P and Gokhale,S.B.(2010)*Pharmacognosy*.45th ed. Pune: Nirali Prakashan.
3. Tyler,V.E.,Brady,R.(1998)*Pharmacognosy*. 9th ed. Philadelphia: Lea and Febiger.
4. Government of India. *Pharmacopoeial standards for Ayurvedic formulations* (Council of Research in Indian medicine and Homeopathy)
5. Mukherjee, P.W. (2002) *Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals*. New Delhi: Business Horizons Publishers.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Choudhary, R.D. (1996) *Herbal Drug Industry*. I[st]ed. New Delhi: Eastern Publishers.
7. Poucher, W.A. (1991) *Poucher's perfumes, cosmetics and soaps*. 9[th]ed. London: Chapman and Hall.
8. Mithal, B.M. (2005) *A Hand book of cosmetics*. 1[st]ed. New Delhi: New age Internationals.
9. AYUSH, (2007) *The Ayurvedic Pharmacopeia of India*. New Delhi: Controller of Publications, I lines.
10. AYUSH, (2002) *The Ayurvedic Formulary of India*. New Delhi: Controller of publications, civil lines

c. Recommended Reading

1. Rangari, V.D. (2003) *Pharmacognosy and Phytochemistry*. Vol 1& II. Nashik: Career Publications.
2. Wallis, T.E. (1967) *Text Book of Pharmacognosy*. New Delhi: CBS Publishers & Distributors.

d. Magazines and Journals

1. Pharma Buzz, Chandigarh-India, 3M Advertisers and Publishers
2. Indian Journal of Traditional Knowledge- CSIR, New Delhi
3. Indian Journal of Natural Products and resources- CSIR, New Delhi
4. Fitoterapia-Elsevier, Netherland

e. Websites

1. www.sciencedirect.com
2. www.pubmed.com
3. www.herbnet.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Biopharmaceutics and Pharmacokinetics (Theory)

Course Title	Biopharmaceutics and Pharmacokinetics Theory
Course Code	BPC352
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart knowledge on biopharmaceutics and pharmacokinetics with their applications in pharmaceutical development. The students are also taught the methods for the estimation of several clinical parameters and fixation of dosage regimen for special population.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain mechanisms of drug absorption, distribution, metabolism, and excretion (ADME) and the factors influencing these processes in the human body

CO-2 Apply concepts of bioavailability, bioequivalence, and dissolution to assess drug product performance and optimize drug delivery

CO-3 Analyze pharmacokinetic models (compartmental and non-compartmental) and calculate key pharmacokinetic parameters for different routes of drug administration

CO-4 Evaluate dosing regimens using pharmacokinetic principles, including multiple dosing, steady-state

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

kinetics, and nonlinear pharmacokinetics

4. Course Contents

Unit 1

Absorption: Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes **Distribution:** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

10 hours

Unit 2

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, *in-vitro in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

10 hours

Unit 3

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - KE, $t_{1/2}$, V_d, AUC, Ka, Cl_t and CL_R - definitions methods of eliminations, understanding of their significance and application **10 hours**

Unit 4 (Multi compartment models):

Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

08 hours

Unit 5 (Nonlinear Pharmacokinetics):

a. Introduction, b. Factors causing Non-linearity. Michaelis-Menten method of estimating parameters, Explanation with example of drugs.

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2	2		3									3	
CO-3	1		3									3	
CO-4			3									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3marks and 3 marks for staff-student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a.Class Notes

b.Essential Reading

1. Milo Gibaldi. (1991) Biopharmaceutics and Clinical Pharmacokinetics, 4th Ed. Philadelphia: Lea and Febiger.
2. D.M. Brahmankar and Sunil B.Jaiswal. (2015) Biopharmaceutics and Pharmacokinetics- A Treatise. Pitampura, Delhi: Vallab Prakashan.
3. Shargel. Andrew B.C. and Yu. (2012) Applied Biopharmaceutics and Pharmacokinetics. 6th Ed. NewYork: McGraw-Hill Medical.
4. James Swarbrick, James and G.Boylan. (1996) Encyclopedia of Pharmaceutical Technology. New York:Marcel

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dekker Inc.
5. Milo Gibaldi and D. Perrier. (1982) Pharmacokinetics .2nd edition, NewYork: Marcel Dekker Inc.,
6. Swarbrick. J. (1970) Current Concepts in Pharmaceutical Sciences: Biopharmaceutics. Philadelphia: Lea and Febiger.
7. Malcolm Rowland and Thom N. Tozer.(1995) Clinical Pharmacokinetics, Concepts and Applications. 3rd Ed. Philadelphia: Lea and Febiger.
8. Abdou. H.M.(1989) Dissolution, Bioavailability and Bioequivalence. Pennsylvania: Mack Publishing Company.
9. Robert. E. Notari. (1987) Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th Ed, New York and Basel: Marcel Dekker Inc.
10. Alfonso R. Gennaro. (1990) Remington's Pharmaceutical Sciences. Pennsylvnia: Mack Publishing Company.
11. Milo and Laurie Prescott.(1983) Handbook of clinical Pharmacokinetics. New York: ADIS Health Science Press.
12. Robert. E. Notari. (1987) Biopharmaceutics and Clinical Pharmacokinetics-- An Introduction. 4thEdition. USA: CRC Press.

c.Recommended Reading

1. Banaker.U.V. (1991) Pharmaceutical dissolution testing. 1st Edition. New York: Marcel Dekker Inc.
2. Welling , Tse.(2006) Pharmacokinetics.2ndEdition.UK: Taylor & Francis.
3. Javed Ali,Khar R. K., Alka Ahuja. (2011) Textbook of Biopharmaceutics and Pharmacokinetics. 3rdEdition. Delhi: Birla Publication Pvt Ltd.
4. Sarfaraz, K.Niazi (1979) Textbook of Biopharmaceutics and Clinical Pharmacokinetics. London: Appleton-Century-Crofts.

d.Magazines and Journals

1. Journal of Applied Biopharmaceutics and Pharmacokinetics. Karachi: Synchro Publisher.
2. International Journal of Pharmaceutics. USA: Elsevier
3. European Journal of Pharmaceutical Sciences. USA: Elsevier

e.Websites

1. www.sciencedirect.com
2. www.pubmed.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Biotechnology Theory

Course Title	Pharmaceutical Biotechnology Theory
Course Code	BPC353
Course Type	Core Theory
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to provide the student knowledge on scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology. Students are introduced to the concepts of genetics, recombinant DNA technology, protein engineering, immunology and biosensors.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	100 **Component 1: 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain enzyme biotechnology principles, genetic engineering, and microbial industrial applications.
CO-2 Summarize recombinant DNA technology, PCR, and therapeutic product applications.
CO-3 Discuss immunological concepts, vaccines, hybridoma technology, and blood products.
CO-4 Elaborate fermentation processes, blotting techniques, microbial genetics, and biotransformation

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1:

a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications. c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries. d) Brief introduction to Protein Engineering. e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. f) Basic principles of genetic engineering.

10 hours

Unit 2:

a) Study of cloning vectors, restriction end nucleases and DNA ligase. b) Recombinant DNA technology. Application of genetic engineering in medicine. c) Application of r DNA technology and genetic engineering in the production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.
d) Brief introduction to PCR

10 hours

Unit 3:

Types of immunity- humoral immunity, cellular immunity, a) Structure of Immunoglobulins b) Structure and Function of MHC, c) Hypersensitivity reactions, Immune stimulation and Immune suppressions. d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, Antitoxins, serum-immune blood derivatives and other products relative to immunity. e) Storage conditions and stability of official vaccines, f) Hybridoma technology- Production, Purification and Applications, g) Blood products and Plasma Substitutes.

10 hours

Unit 4:

a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting, b) Genetic organization of Eukaryotes and Prokaryotes, c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. d) Introduction to Microbial biotransformation and applications. e) Mutation: Types of mutation/mutants

8 hours

Unit 5:

a) Fermentation methods and general requirements, study of media, equipment's, sterilization methods aeration process, stirring. b) Large scale production fermenter design and its various controls. c) Study of the production of - penicillin's, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

7 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3			2								3	
CO-2	2											3	
CO-3	3											3	2
CO-4	3											2	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Numeracy		15
1. Solving Numerical Problems	00	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	75 Marks
Maximum Marks	4	6	15	
CO-1			×	×
CO-2			×	×
CO-3			×	×
CO-4			×	×
The details of SC1, SC2, SC3 or SC4 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.
Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Classroom lectures, Self-study
3.	Critical Skills	Assignment
4.	Analytical Skills	Assignment
5.	Problem Solving Skills	Assignment, Examination
6.	Practical Skills	Assignment
7.	Group Work	--
8.	Self-Learning	Self-study
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	--
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

9. Course Resources

a. Class notes

b. Essential Reading

1. Glick, B.R. and Pasternak J.J. (1994) Molecular Biotechnology: Principles and Applications of Recombinant DNA. Washington D.C: ASM Press 3. Goldsby, R. A., Kindt, Osborne.
2. Kuby Immunology. 6th ed. New York: W H Freeman & Co
3. Goding, J.W. (1983) Monoclonal Antibodies: Principles and Practice. Academic Press
4. Walker, J.M. and Gingold, E.B. (1985) Molecular Biology and Biotechnology. London: Royal Society of Chemistry.
5. Zaborsky. (1973)Immobilized Enzymes. Degraland, Ohio: CRC Press.
6. Stanbury, F. P., Whitakar, A. and Hall J, S. (2016) Principles of fermentation technology.3rded.New Delhi: Elsevier
7. Gupta, P.K. (2004) Elements of Biotechnology. 1sted. New Delhi: Rastogi Publications
8. Vyas, S.P. and Dixit V.K. (2007) Pharmaceutical Biotechnology. New Delhi: CBS Publishers

c. Recommended Reading

1. Razdan, M.K. (2003) Introduction to Plant Tissue Culture. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
2. AshutoshKar. (2003) Pharmacognosy and Pharmacobiotechnology. I[st] ed. New Delhi: New Age International Publishers.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

d. **Magazines and Journals**

1. Biotech Express-Kash Biotech, Ghaziabad, UP
2. Indian Journal of Biotechnology- CSIR, New Delhi
3. Biotechnology and Bioengineering-Wiley-V C H Verlag & co, Germany

e. **Websites**

1. www.sciencedirect.com
2. www.pubmed.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Quality Assurance Theory

Course Title	Quality Assurance Theory
Course Code	BPC354
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to create awareness among students about quality control and quality assurance in pharmaceutical industries. It deals with the important aspects like current Good Manufacturing Practices, Quality Control Tests, documentation, quality certifications and regulatory affairs.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the fundamental principles of Quality Control (QC), Quality Assurance (QA), Total Quality Management (TQM), Quality by Design (QbD), ICH guidelines, ISO standards, and NABL accreditation in the pharmaceutical industry.

CO-2 Discuss the organizational structure, personnel responsibilities, training, hygiene practices, facility design, equipment selection, raw material control, and quality control tests involved in pharmaceutical manufacturing and quality systems.

CO-3 Apply the principles of Good Laboratory Practices (GLP), documentation systems, complaint handling, product recall, quality audits, and regulatory record-keeping in pharmaceutical operations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

CO-4 Analyze the concepts of calibration, qualification, validation, and good warehousing practices for ensuring quality, safety, and compliance in pharmaceutical industries

4. Course Contents

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines, Quality by Design (QbD): Definition, overview, elements of QbD program, tools ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration NABL accreditation: Principles and procedures

Organization and personnel: Personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials. Quality Control: Quality control test for containers, rubber closures and secondary packing materials

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities.

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal. Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Warehousing: Good warehousing practice, materials management

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		3										3	2
CO-2		3					3			2		2	
CO-3		3					3			2			2
CO-4							3					3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		05
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

1. Class notes
2. Quality Assurance Guide Vol I and II (2001) Organization of Pharmaceutical Producers of India, Mumbai.
3. Quality Assurance of Pharmaceuticals- A compendium of Guidelines and related materials Vol I WHO Publications Geneva. International Organization for Standardization (2015) Quality management principles.
4. The International Pharmacopoela – Vol I, II, III, IV General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms.
5. Manohar A. Potdar (2007) Pharmaceutical Quality assurance Nirali Prakashan New Delhi

b. Recommended Reading

1. Shayne Cox Gad (Ed) (2008) Pharmaceutical Manufacturing Handbook: Regulations and Quality Wiley.

2. Sandy Weinberg (2003) 3rd ed. Good laboratory Practices and regulations Marcel Dekker Inc. USA.

c. Magazines and Journals

1. Indian journal of Pharmaceutical Sciences, IPA, Mumbai, India.
2. Journal of Pharmaceutical Analysis, Elsevier, Amsterdam, Netherlands.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. International Journal of chemical and Pharmaceutical Sciences, Pharma research library, India.

d. Websites

1. http:// www.ich.org/
2. https://www.analytic-news.com/

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Medicinal Chemistry III Practical

Course Title	Medicinal Chemistry III Practical
Course Code	BPL355
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart knowledge on stereo-chemical aspects of organic compounds, chemistry and synthesis of important hetero cyclic compounds and important named reactions. It also emphasizes on medicinal and other uses of organic compounds.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	Total marks: 50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Apply appropriate laboratory techniques to synthesize selected pharmaceutical compounds and intermediates, ensuring safe handling practices

CO-2 Analyze and interpret the results of pharmaceutical assays

CO-3 Construct chemical structures, reaction schemes, using ChemDraw / other tools and predict physicochemical properties using computational tools.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

I Preparation of drugs and intermediates

1. Sulphanilamide
2. 7-Hydroxy, 4-methyl coumarin
3. Chlorobutanol
4. Triphenyl imidazole
5. Tolbutamide
6. Hexamine

II Assay of Drugs

1. Isonicotinic acid hydrazide
2. Chloroquine
3. Metronidazole
4. Dapsone
5. Chlorpheniramine maleate
6. Benzyl penicillin

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique

IV Drawing structures and reactions using chem draw®

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs in course content using drug design softwares - Drug likeliness screening (Lipinski's ROS)

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		2		2				1				3	
CO-2		2		1				2				2	
CO-3				3				2				2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		
Practical Work		55
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical record/viva voce	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

1A: The marks allocated for Continuous mode of internal Assessment shall be awarded as per the scheme given below.

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc.	3
Total	5

Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1 B: Practical and Regular viva voce – 03 Marks

1C. Sessional exam: Two tests (each for 40 marks) of 4 hours duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination

Component - 2: 35 marks

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

A 4 hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a.Essential Reading

1. Furniss, BS. Hannaford, AJ. Smith, PWG. Tatchell, AR. (1996). *Vogel's Textbook of Practical Organic Chemistry* 5th Edition. New York: John Wiley and Sons, Inc.
2. Mann, PG. and Saunders, BC. (1960) Practical Organic Chemistry. 9th Edition. London: ELBS Longman.
3. Ministry of Health and Family Welfare, Govt. of India. (2010) Indian

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Pharmacopoeia. 6th Edition. Ghaziabad: Indian Pharmacopoeia Commission.

c. Recommended Reading

1.Vogel AI. (2004) Elementary Practical Organic Chemistry Part -II, Qualitative Organic Analysis. 2nd Edition New Delhi: CBS Publishers and Distributors.
2. Vogel AI (2004) Elementary Practical Organic Chemistry Part III, Quantitative Organic Analysis. 2nd Edition New Delhi: CBS Publishers and Distributors.

d. Magazines and Journals

1. Indian Journal of Chemistry Section –B. New Delhi: Niscair.
2. European Journal of Medicinal Chemistry. Amsterdam: Elsevier.
3. Indian Journal of Pharmaceutical Sciences. Mumbai: IPA.

e. Websites

1. www.chemtube3d.com
2. www.organic-chemistry.org
3. www.rsc.org
4. www.cismasia.com/india

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacology III Practical

Course Title	Pharmacology III Practical
Course Code	BPL356
Course Type	Core Practical
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to provide training on drug evaluation using animals as well as computer models to acquire research skills and prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	50 **Component 1:** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Identify drug doses and demonstrate effect of drugs using computer models
CO-2 Determine drug toxicity, pharmacokinetics and safety using standard experimental guidelines.
CO-3 Estimate biochemical parameters and analyze experimental data using appropriate statistical methods

4. Course Contents

1. Dose calculation in pharmacological experiments
2. Anti-allergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD_{50}) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology (Student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

*Experiments are demonstrated by simulated experiments/videos

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3			3								3	
CO-2			3				3					3	
CO-3			3								3	3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		00
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		00
Practical Work		50
1. Course Laboratory	50	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Discussing Possible Innovations	00	
Laboratory Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		x	x	x
CO-2		x	x	x
CO-3		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 15 marks

Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks

1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc	3
Total	5

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Marks**
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1 B: Practical and Regular viva voce – 03 Marks

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1C. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks
A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35 and evaluated by concerned course leader and External examiner.

Reassessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work
7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a.Class Notes
b.Essential Reading

1. Kulkarni, S.K. (1999) Hand Book of Experimental Pharmacology, 3rd edn, New Delhi: Vallabh Prakashan.
2. Ghosh, M.N. (2008) Elements of Experimental Pharmacology, 4th edn, Kolkata: Hilton and Company

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Goyal, R.K. (2000) Practicals in Pharmacology, 2nd edn, Ahmedabad: BS Shah Prakashan.
4. Vrushabendra Swamy, B.M., Jayaveera, K.N. and Venkateshwar Reddy, A. (2014) Experimental Pharmacology and Toxicology, New Delhi: Chand and Company Pvt. Ltd.

c.Recommended Reading

1. Vogel, H.G. (2002) Drug discovery and evaluation. 2nd edn. New York: Springer.
2. Parmer, N.S. and Prakash, S. (2006) Screening Methods in Pharmacology, New Delhi: Narosa Publishing House.
3. Turner, R.A. (1965) Screening Methods in Pharmacology, New York: Academic Press.

d.Magazines and Journals

1. Indian Journal of Pharmacology
2. Journal of Pharmacology and Experimental Therapeutics
3. European journal of Pharmacology
4. British Journal of Pharmacology

e. Websites

1. www.icp.org.nz
2. www.craigslist.org
3. www.druglib.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Herbal Drug Technology Practical

Course Title	Herbal Drug Technology Practical
Course Code	BPL357
Course Type	Core Practical
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to train the students to perform phytochemical studies of herbal extracts, prepare herbal formulations and herbal cosmetics. Students are also trained on the evaluation of phytoconstituents as per standard guidelines.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	72
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	50
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Perform phytochemical screening and quantitative estimation of phytoconstituents
CO-2 Evaluate natural excipients and perform monograph analysis for herbal drugs
CO-3 Formulate and evaluate herbal cosmetics and pharmaceutical preparations.

4. Course Contents

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

8. Determination of Phenol content
9. Determination of total alkaloids

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		3	3					2				2	
CO-2		2	2					2					2
CO-3		3	3					2					2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1.Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Tutorials		00
Practical Work		60
1. Course Laboratory	60	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination		12
Total Duration in Hours		**72**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (30% Weightage)			Component 2: SEE (70% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Practical Record, viva voce, etc.	Sessional Exam	Semester End Examination 35 Marks
Maximum Marks	2	3	10	
CO-1			X	X
CO-2			X	X
CO-3			X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Practical Record and Regular Viva voce: 03 Marks

1C. Sessional exam: Two tests (each for 40 marks) of 4 hours duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of two tests reduced to 10 marks will be the marks scored in Sessional Examination.

Component - 2: 35 marks

A 4 hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by the course leader and external examiner.

Re-assessment

1. A student who fails to secure a minimum of 50% in component-1 and 2 put together will be

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

asked to register for the Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for the Supplementary examination.
3. The maximum number of such opportunities is limited and as per the academic regulations governing this programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	Course Laboratory/work
7.	Group Work	Course Laboratory/work
8.	Self-Learning	Course Laboratory/work
9.	Written Communication Skills	Course Laboratory/work
10.	Verbal Communication Skills	Course Laboratory/work
11.	Presentation Skills	Course Laboratory/work
12.	Behavioral Skills	Course Laboratory/work
13.	Information Management	Course Laboratory/work
14.	Personal Management	Course Laboratory/work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Harborne, J.B. (1998) *Phytochemical Methods - A Guide to Modern Techniques of PlantAnalysis*. 3rd ed. London: Chapman and Hall.
2. Gokhale, S.B, and Kokate, C.K. (2008) *Practical Pharmacognosy*. 12th ed. New Delhi: Nirali Prakashan.
3. WHO Report. (1991) Guidelines for the Assessment of Herbal Medicines: Geneva.
4. AYUSH. (2007) *The Ayurvedic Pharmacopeia of India*. New Delhi: Controller of publications, civil lines.
5. AYUSH. (2002) *The Ayurvedic Formulary of India*. New Delhi: Controller of publications, civil

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

lines

b. Recommended Reading

1. Rangari, V.D. (2008) Pharmacognosy and Phytochemistry. Vol II. Nasik: Career Publications.
2. Kokate, C.K., Purohit A.P and Gokhale, S.B. (2010) *Pharmacognosy*. 45th ed. Pune: Nirali Prakashan.

c. Magazines and Journals

1. Pharma Buzz, Chandigarh- India, 3M Advertisers and Publishers
2. Phytochemistry- Elsevier, Netherland
3. Indian Journal of Traditional Knowledge- CSIR, New Delhi
4. Indian Journal of Natural Products and Sciences- CSIR, New Delhi

d. Websites

1. www.pubmed.com
2. www.scirus.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 7

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Course Specifications: Instrumental Methods of Analysis (Theory)

Course Title	Instrumental Methods of Analysis Theory
Course Code	BPC458
Course Type	Core Theory
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

This course deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This course is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic techniques.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	16
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the principles, instrumentation, and applications of various analytical techniques such as UV-Vis, IR
- **CO-2** Summarize flame photometry, Atomic apbsorption spectroscopy, Nephelo-turbidimetry in pharmaceutical analysis
- **CO-3** Discuss the principle, instrumentation and applications of various chromatographic methods and electrophoresis
- **CO-4** Elaborate on the working of the modern analytical instruments HPLC and GC

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1:

UV Visible spectroscopy

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications **10 hours**

Unit 2:

IR spectroscopy

Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

Flame Photometry-Principle, interferences, instrumentation and applications 144

Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications

Nepheloturbidometry- Principle, instrumentation and applications

10 hours

Unit 3:

Introduction to chromatography

Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications.

Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications

Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications **10 hours**

Unit 4:

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.

8 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 5:

Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

Gel chromatography- Introduction, theory, instrumentation and applications

Affinity chromatography- Introduction, theory, instrumentation and applications

7 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3			1							2		2
CO-2	2			1								1	
CO-3	3			2							2		2
CO-4	2			3							2		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by both course leader/s.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

3. Essential Reading

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Class Notes

1. Connors KA (1982) *A Textbook of Pharmaceutical Analysis*, 3rd Edition. New York: John Wiley and sons.
2. Mendham J, Denny RC, Barnes JD and Thomas M (2008) *Textbook of Quantitative Chemical Analysis, Seventh Impression*, India: Dorling Kindersley Pvt. Ltd.
3. Willard HH, Merritt LL, Dean JA and Settle FA. (1986) *Instrumental Methods of Analysis*, 7th Edition, New Delhi: CBS Publishers and Distributors.
4. Kemp W (2008) *Organic Spectroscopy*, 3rd Edition. New York: Palgrave.
5. Skoog DA, West DM and Hollen FG. *Fundamentals of Analytical chemistry*, 6th Edition., USA: Saunders College Publishing.
6. Kubeczka KH. and Formacek V. *Essential Oils Analysis By Capillary Gas Chromatography and C^{13}NMR* nd *spectroscopy*, 2nd Edition. England: John Wiley and Sons Ltd.

5. Recommended Reading

1. Beckett AH, Stenlake JB (2004) Practical Pharmaceutical Chemistry, Vol I and II. London: The Athlone Press of the University of London.
2. Silverstein RM. and Webster FX (2004) Spectrometric Identification of Organic Compounds, 6Edition. New York: John Wiley and Sons
3. Hoffmann ED. and Stroobant V (2001) Mass Spectrometry, 2Edition. England: John Wiley and Sons Ltd.
4. Joule JA and Mills K (2008) Heterocyclic Chemistry, 4Edition. UK: Blackwell Science Ltd.

6. Magazines and Journals

1. Indian journal of Pharmaceutical Sciences, IPA, Mumbai India
2. Journal of Pharmaceutical Analysis, Elsevier, Amsterdam, Netherlands
3. International Journal of chemical and Pharmaceutical Sciences, Pharma Research Library India

e. **Websites**

1. http://www.chemseer.com/journals/journals_inorganic.shtml
2. http://www.web-formulas.com/

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Industrial Pharmacy-II Theory

Course Title	Industrial Pharmacy-II Theory
Course Code	BPC459
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market. The aim of this course is to introduce the principles of regulatory requirements of pharmaceuticals in India and abroad. It also covers guidelines of international agencies and regulatory bodies to ensure the quality of pharmaceutical products across the globe.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture:Tutorial:Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the process of pilot scale of operations from lab scale to commercial batch
- **CO-2** Describe the principles and documentation guidelines of technology development and transfer in pharmaceuticals
- **CO-3** Discuss indian and global regulatory guidelines, IND, NDA with approval procedures for new drugs and relevance of QMS that support drug product development
- **CO-4** Analyze the principles of supply chain mamagement, good distribution practices and global SCM

4. Course Contents

Unit 1 (Pilot plant scale up techniques):

General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

10 hours

Unit 2 (Technology development and transfer):

WHO guidelines for Technology Transfer (TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer.

Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

10 hours

Unit 3 (Regulatory affairs):

Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals, Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology.

General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

10 hours

Unit 4(Quality management systems):

Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

08 hours

Unit 5(Indian Regulatory Requirements):

Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

07 hours

Unit 6 (Supply Chain Management) *

Introduction to Supply chain management (SCM) and its role in the pharmaceutical industry, Brief introduction of the regulations governing pharmaceutical SCM and Good Distribution Practices, Customer relationship management and supplier relationship management, Role of Information Technology in efficient management of SCM, Global and local/domestic SCM

03 hours

[*Approved by the Academic Council at its 36th meeting held on 27 September 2025]

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3									3	
CO-2						3						3	
CO-3							3					3	
CO-4											3	3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		
1.Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop /	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore 560054

Kitchen		
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	01	
2. Guest Lecture	00	
3. Industry / Field Visit	00	05
4. Brain Storming Sessions	02	
5. Group Discussions	02	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leaders.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Quality Assurance Guide by Organization of Pharmaceutical Procedures of India, (1996), 3rd revised Edition. Vol I & II, Mumbai.
2. Sandy Weinberg. (1995) Good Laboratory Practice Regulations, 2nd Edition. New York: Marcel Dekker Inc.
3. Quality Assurance of Pharmaceuticals: A Compendium of Guidelines and Related Materials, (1999), 2nd Edition. Vol I & II, WHO Publications.
4. Deshpande, Nilesh Gandhi. (2006) The Drugs and Cosmetics Act 1940, 4th Edition. Ahmedabad: Susmit Publishers.
5. Pisano, Douglas. FDA Regulatory Affairs. 1st ed. Informa Healthcare, 2008.

c. Recommended Reading

1.Sharma PP. (2010) How to Practice GMP's, 6th Edition. Agra: Vandana Publications.
2. Guarino RA. (2004) New Drug Approval Process, 4th Edition. New York: Marcel Dekker Inc.
3. Parikshit Bansal. (2004) IPR Handbook for Pharma Students and Researchers, Hyderabad: Pharma Book Syndicate.
4. Subbaram NR. (2005) Patents, Hyderabad: Pharma Book Syndicate.(2012).

d. Magazines and Journals

a. Indian Journal of Pharmaceutical Sciences. Mumbai, OMICS International 2. International Journal of Pharmaceutics. USA. Elsevier.
b. Journal of Pharmaceutical Sciences. Mumbai: OMICS International.

e. Websites

a. www.usfda.gov
b. www.mhra.gov.uk
c. www.ich.org
d. www.wipo.intamericanpharmaceuticalreview.com
e. www.mohfw.nic.in

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacy Practice Theory

Course Title	Pharmacy Practice Theory
Course Code	BPC460
Course Type	Core Theory
Department	Pharmacy Practice
Faculty	Pharmacy

1. Course Summary

In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacy Practice
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Analyze hospital organization, drug distribution systems, budgeting, and inventory control practices
- **CO-2** Plan medication history interviews, patient counselling, and recommend pharmaceutical care services
- **CO-3** Explain therapeutic drug monitoring and elaborate on the significance of clinical laboratory tests
- **CO-4** Assess drug-related problems and adverse drug reactions

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1

Hospital and it's organization: Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

Hospital pharmacy and its organization: Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

Adverse drug reaction: Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

Community Pharmacy: Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

10 Hours

Unit 2:

Drug distribution system in a hospital: Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

Hospital formulary: Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

Therapeutic drug monitoring: Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

Medication adherence: Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

Patient medication history interview: Need for the patient medication history interview, medication interview forms.

Community pharmacy management: Financial, materials, staff, and infrastructure requirement

10 hours

Unit 3:

Pharmacy and therapeutic committee: Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

Drug information services Drug and Poison information centre, Sources of drug information,
Computerized services, and storage and retrieval of information.

Patient counseling: Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

Education and training program in the hospital: Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

Prescribed medication order and communication skills

Prescribed medication order- interpretation and legal requirements, and Communication skills communication with prescribers and patients.

10 hours

Unit 4:

Budget preparation and implementation

Clinical Pharmacy: Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.
Over the counter (OTC) sales: Introduction and sale of over the counter, and Rational use of common over the counter medications.

08 hours

Unit 5:
Drug store management and inventory control
Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking,
Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

Investigational use of drugs: Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee

Interpretation of Clinical Laboratory Tests: Blood chemistry, hematology, and urine analysis

07 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		2			1	1					3	2
CO-2	2		3			3	2					3	2
CO-3	3		2			2	1					3	2
CO-4	3		3			3	3					3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	2	
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop /	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Kitchen		
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		**X**	**X**	**X**
CO-2		**X**	**X**	**X**
CO-3		**X**	**X**	**X**
CO-4		**X**	**X**	**X**
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Percentage of Attendance	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks
A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

a. Merchant, S.H. and Quadry, J.S. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakashan; 2001.

b. Parthasarathi, G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy, Practice- essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.

c. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea & Febiger; 1986.

d. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications; 2008.

e. Scott LT. Basic skills in interpreting laboratory data, 4thed. American Society of Health System Pharmacists Inc; 2009.

f. Parmar N.S. Health Education and Community Pharmacy, 18th ed. India: CBS Publishers & Distributers; 2008.

c. Recommended Reading

a. Shargel, L. (2009) Comprehensive Pharmacy Review, Baltimore: Lippinicott Willams and Wilkins.

b. Preston. (2013) Stockley's Drug Interactions, London: Pharmaceutical Press.

c. Koda-kimble, M.A., Alldredge, B.K., Corelli, R.L., Ernst, M.E., Guglielmo, B.J., Jacobson, P.A., Kradjan, W.A. and Williams, B.R. (2013) Applied Therapeutics: The Clinical use of Drugs. 10th Edition. Philadelphia: Lippincott Williams and Wilkins Publication.

d. Magazines and Journals

1. Indian Journal of pharmacy practice.

e. Websites

1. www.medscape.com
2. www.ovid.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Novel Drug Delivery Systems Theory

Course Title	Novel Drug Delivery Systems Theory
Course Code	BPC461
Course Type	Core Theory
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart elementary knowledge on the area of novel drug delivery systems and emphasizes approaches, formulations, technologies and systems for better therapeutic benefits.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Analyze the principles, design approaches, and drug properties involved in controlled and advanced drug delivery systems.
CO-2 Propose appropriate formulation strategies based on drug and biological factors
CO-3 Apply advanced drug delivery approaches using modern formulation techniques
CO-4 Evaluate recent advancements in drug delivery systems to support continuous professional development and innovation

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 (Controlled drug delivery systems): Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

10 hours

Unit 2

Microencapsulation: Definition, advantages and disadvantages, microspheres / microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump

10 hours

Unit 3

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastro retentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastro adhesive systems and their applications

Naso pulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

10 hours

Unit 4

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications.

08 hours

Unit 5

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3	2								3	
CO-2			3	2								3	
CO-3			3	3								3	
CO-4											3	3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for student-staff interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.

Both components will be moderated by the concerned course leader/s.

Re-assessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class Notes**
b. **Essential Reading**

1. Robinson, J. R., Lee Vincent. (1987) Controlled Drug Delivery: Fundamentals and Applications.2nd Ed. New York: Marcel Dekker Inc.
2. Chien, Y.W. (1991) Novel Drug Delivery Devices: Fundamentals, Developmental Concepts, Biomedical Assessments. New York: Marcel Dekker.
3. Vyas, S.P, Khar, R.K. (2012) Controlled Drug delivery: Concepts and Advances. 2nd ed. Delhi: Vallabh Prakashan

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean /Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Jain, N.K. (2010) Advances in Novel Drug Delivery Systems. 3rd ed. India: CBS Publishers.
5. Swarbrick,J. (2007) Encyclopedia of Pharmaceutical Technology. 3rd ed. New York: Marcel Dekker Inc.
6. Khar, R.K. et al. (2013) Lachman / Lieberman: The Theory and Practice of Industrial Pharmacy. 4th ed, New Delhi: CBS publishers.
7. Gennaro. A.R (Ed). (2012) Remington: The Science and Practice of Pharmacy, 22nd ed, Vol- I and Vol–II. New Delhi: Lippincott Williams and Wilkins.
8. Tyle, P. (1988) Drug Delivery Devices: Fundamentals and Applications. Volume 32, New,York: Marcel Dekker.
9. Ranade, V.V. & Hollinger, M.A. (2004) Drug Delivery Systems. 2nd ed. USA: CRC PressWise, D.L. (2000) Handbook of Pharmaceutical Controlled Release Technology. New York: Marcel Dekker Inc.Edith Mathiowitz., (1999) Encyclopedia of Controlled Delivery. New York: Wiley Interscience Publication

c. Recommended Reading

1.Troy, DB & Beringer, P. (2006) Remington's: The Science and Practice of Pharmacy. 22nd ed. New York: Lipincott Williams and Wilkins.
2. Banker, G.S, Rhode, C. T. (2002) Modern Pharmaceutics. 4th ed. New York: Marcel Dekker Inc.
3. Bharath, S. (2012) Pharmaceutical Technology- Concepts and Applications, Asia: Pearson Publishers.
4. Bharath, S. (2012) Pharmaceutical Technology- Concepts and Applications. Asia: Pearson Publishers.
5. Li, X. & Jasti, BR. (2006) Design of Controlled Release Drug Delivery Systems. New York: McGraw-Hill.

d. Magazines and Journals

1. Indian Journal of Pharmaceutical Sciences. Mumbai, OMICS International
2. Indian Drugs, Mumbai, IDMA.
3. Journal of Controlled Release. United Kingdom, Elsevier
4. Drug Development and Industrial Pharmacy. United Kingdom, Informa Pharmaceutical Science.
5. International Journal of Pharmaceutics. Amsterdam: Elsevier.

e. Websites

1. www.sciencedirect.com
2. www.pubmed.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Instrumental methods of Analysis (Practical)

Course Title	Instrumental methods of Analysis Practical
Course Code	BPL462
Course Type	Core Practical
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to train students in Instrumental methods of pharmaceutical analysis. The course provides a platform for analysis of pharmaceutical samples using instruments such as UV-Visible spectrophotometer, nephelo-turbidometer, Fluorimeter. The course also emphasizes separation and identification of compounds in mixtures using chromatographic techniques.

2. Course Size and Credits:

Number of Credits	02
Credit Structure (Lecture: Tutorial: Practical)	0:0:4
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	Total marks: 50 **Component 1(IA): 15 Marks** 1A: Continuous mode: 05 Marks (03+02) 1B: Sessional examination: 10 Marks **Component 2 (SEE):** Semester End Examination: 35 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Identify the components of a mixture by using chromatographic separation techniques
- **CO-2** Estimate the quantity of a drug in a given mixture or solution using appropriate analytical methods
- **CO-3** Analyse samples using fluorimetric and nepheloturbidimetric techniques

4. Course Contents

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2. Estimation of dextrose by colorimetry
3. Estimation of sulfanilamide by colorimetry
4. Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5. Assay of paracetamol by UV- Spectrophotometry

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6 Estimation of quinine sulfate by fluorimetry
7 Study of quenching of fluorescence
8 Determination of sodium by flame photometry
9 Determination of potassium by flame photometry
10 Determination of chlorides and sulphates by nephelo turbidometry
11 Separation of amino acids by paper chromatography
12 Separation of sugars by thin layer chromatography
13 Separation of plant pigments by column chromatography
14 Demonstration experiment on HPLC
15 Demonstration experiment on Gas Chromatography

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		2		3							2	3	
CO-2		3		3							2	3	2
CO-3		2		3							2	3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		
Practical Work		
1. Course Laboratory	60	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	60
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		12
Total Duration in Hours		**72**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (70% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Practical record/viva voce**	**Sessional Exam**	**Semester End Examination 35 Marks**
Maximum Marks	**2**	**3**	**10**	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 15 marks
Conduct of Laboratory Exercises and Sessional examinations

1A: Continuous mode: 05 Marks
1 B: Sessional examination: 10 Marks

Practical	
Attendance(refer table below)	2
Based on practical records, regular viva voce, etc	3
Total	5

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	2
90 – 94	1.5
85 – 89	1
80 – 84	0.5
Less than 80	0

1B. Sessional exam: Two sessional exams (each for 40 marks) of 4 hours' duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 10 will be the marks scored in the Sessional Examination

Component - 2: 35 marks

A 4-hour duration Semester End Practical Examination will be conducted for maximum marks of 35. Component 2 will be evaluated by course leader and external examiner.

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Laboratory work
2.	Understanding	Laboratory work
3.	Critical Skills	Laboratory work
4.	Analytical Skills	Laboratory work
5.	Problem Solving Skills	Laboratory work
6.	Practical Skills	Laboratory work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7.	Group Work	Laboratory work
8.	Self-Learning	Laboratory work
9.	Written Communication Skills	Laboratory report
10.	Verbal Communication Skills	Regular assessment and viva voce
11.	Presentation Skills	Laboratory report
12.	Behavioral Skills	Course work
13.	Information Management	Laboratory report
14.	Personal Management	Course work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1 Connors, KA. (1982) A Textbook of Pharmaceutical Analysis, 3 Edition., New York: John Wiley and Sons.

2 Mendham J, Denny RC, Barnes JD and Thomas M (2008) *Textbook of Quantitative Chemical Analysis*, Seventh Impression, India: Dorling Kindersley Pvt. Ltd.

3 Willard HH, Merritt LL, Dean JA and Settle FA (1986) *Instrumental Methods of Analysis*, 7 Edition, New Delhi: CBS Publishers and Distributors.

b. Reference Books

1 Silverstein RM and Webster FX (2004) Spectrometric Identification of Organic Compounds, 6th Edition, New York: John Wiley and Sons

2 Joule JA and Mills K (2008) Heterocyclic Chemistry, 4th Edition, UK: Blackwell Science Ltd.

3 Kemp W (2008) *Organic Spectroscopy*, 3rd Edition. New York: Palgrave.

4 Skoog DA, West DM and Hollen FG. *Fundamentals of Analytical Chemistry*, 6Edition, USA: Saunders College Publishing.

c. Magazines and Journals

1 Indian journal of Pharmaceutical Sciences, IPA, Mumbai India

2 Journal of Pharmaceutical Analysis, Elsevier, Amsterdam, Netherlands

3 International Journal of chemical and Pharmaceutical Sciences, Pharma Research Library India

d. Websites:

www.scirus.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Practice School - Pharmaceutical Chemistry

Course Title	Practice School - Pharmaceutical Chemistry
Course Code	BPM463-PC
Course Type	Skill enhancement
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to develop skills in computer aided lead optimization techniques, systematic analytical methodology using instruments like HPLC, UV -Visible spectrophotometer and interpretation of spectral data. Students are also exposed to use modern instruments for identification of medicinal substances.

2. Course Size and Credits:

Number of Credits	06
Credit Structure (Lecture: Tutorial: Practical)	0:0:12
Total Hours of Interaction	150
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutical Chemistry
Total Course Marks	180 **Component 1(CE): 25 Marks** 1A: Attendance: 4 Marks 1B: Student -Teacher interaction: 6 Marks 1C: Assignment: 15 Marks **Component 2 (SEE): 125 Marks** Report submission: 50 Marks Presentation: 75 marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Analyze and interpret the pharmaceutical compounds by spectroscopic and chromatographic techniques (UV–Visible, IR, TLC).
- **CO-2** Apply the concept of Design of Experiments (DoE) for HPLC method development
- **CO-3** Apply and analyze computational tools for molecular docking, ADMET prediction, homology modelling, and QSAR/pharmacophore modelling in drug design
- **CO-4** Develop and present comprehensive technical reports and project outcomes, demonstrating effective communication, leadership, and teamwork skills in pharmaceutical research settings

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1:

Quantitative UV -visible Spectrophotometric analysis and interpretation of IR spectra
Method development and Visualization by TLC

30 hours

Unit 2:

Optimization of an Analytical method using design of experiment (DOE) approach
Analytical Method development and Validation by HPLC

40 hours

Unit 3:

Concepts and practice sessions of Homology modelling, Drug Databases retrieval
Software based learning and Hands on training in Molecular docking and ADMET studies

40 hours

Unit 4:

Methodology of 2D Quantitative structure- activity relationships (2D QSAR) and 3D QSAR
Pharmacophore concept and hands on training in Pharmacophore modelling

40 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3	3	1			2				3	2
CO-2			3	3	2			2				3	2
CO-3			3	3	2			2				3	3
CO-4			2	2	3			3				2	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		15
1.Demonstration using Videos	0	
2. Demonstration using Physical Models / Systems	5	
3. Demonstration on a Computer	10	
Tutorials		00
Practical Work		120
1. Course Laboratory	56	
2. Computer Laboratory	64	
3. Engineering Workshop / Course/Workshop /	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Kitchen		
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	03	
2. Guest Lecture	02	
3. Industry / Field Visit	00	15
4. Brain Storming Sessions	05	
5. Group Discussions	05	
6. Discussing Possible Innovations	00	
Presentation		5
Total Duration in Hours		**185**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (17% Weightage)			**Component 2: SEE (83% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Teacher Student Interaction**	**Assignment**	**Report submission and Presentation 50+75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		**X**	**X**	**X**
CO-2		**X**	**X**	**X**
CO-3		**X**	**X**	**X**
CO-4		**X**	**X**	**X**
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

80 – 84	1
Less than 80	0

1B. Staff - student interaction: 6 marks.
1C. Assignment: Student is required to submit 1 word processed assignment which is set for 30 marks at the end of 14th week and the marks scored will be reduced to 15 marks.

Component - 2: 125 marks
A report has to be submitted at the end of the Practice school for maximum of 50 marks and a presentation will be conducted for maximum of 75 marks and evaluated by concerned course leader/s.

Evaluation of Report:

Objectives carried out and its outcomes	25 marks
Conclusion of work	25 marks
Total Marks	**50 marks**

Evaluation of Presentation:

Presentation of work	25 marks
Communication skills	25 marks
Question and answer skills	25 marks
Total Marks	**75 Marks**

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course laboratory/work
2.	Understanding	Course laboratory/work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3.	Critical Skills	Course laboratory/work
4.	Analytical Skills	Course laboratory/work
5.	Problem Solving Skills	Course laboratory/work
6.	Practical Skills	Course laboratory/work
7.	Group Work	Course laboratory/work
8.	Self-Learning	Course laboratory/work
9.	Written Communication Skills	Course laboratory/work
10.	Verbal Communication Skills	Course laboratory/work
11.	Presentation Skills	Course laboratory/work
12.	Behavioral Skills	Course laboratory/work
13.	Information Management	Course laboratory/work
14.	Personal Management	Course laboratory/work
15.	Leadership Skills	Course laboratory/work

9. Course Resources

a. Essential Reading

a. Silverman, R. B. and Hooladay, M. W. (2014) The Organic Chemistry of Drug design and drug action 3rd edn. Amsterdam: Elseveir.
b. Charifson, P. S. (1997). Practical Applications of Drug Design. Taylor and Francis.
c. Silverstein, R. M. Webster, F. X. Solomon, T. W. G. (2015) Solomon's Organic Chemistry 11th edn. USA: John Wiley and Sons, Inc.
d. Willard, H. H. Merritt, Jr. L. L. Dean, J. A. and Settle, Jr. F. A. (1988) Instrumental methods of analysis, 7th edition. New Delhi: CBS Publishers and Distributors Pvt Ltd.
e. Pavia, D. L. Lampman, G. M. and Kriz, G. S. (2001). Introduction to Spectroscopy 3rd edn. Singapore: Thompson Learning

b. Recommended Reading

3. Roberts, G. C. K. (1977) Drug Action at the Molecular level 1st edn. UK: Plagrave Mcmillan.
4. Leach, A. (2001) Molecular Modelling Principles and Applications 2nd edn. UK: Pearson.
5. Cohen, N. C. (1996) Guidebook on Molecular Modelling in Drug Design 1st edn Netherlands: Elsevier.
6. Goodman, J. M. (2007) Chemical Applications of Molecular Modelling 2nd edn. UK: Royal Society of Chemistry.
7. Guner, O. F. (2000) Pharmacophore Perception, Development and Use in Drug Design 2nd edn. TBS The Book Service Ltd.

c. Magazines and Journals

1. Journal of Computational Chemistry – Wiley Online Library USA
2. Journal of Theoretical and Computational Chemistry – World Scientific California
3. Journal of Molecular Modeling – Springer,UK
4. Journal of Pharmaceutical Analysis – Elsevier
5. Current Pharmaceutical Analysis – Bentham Science
6. Indian Drugs
7. Indian Journal of Pharmaceutical Sciences.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

d. Websites

1. https://salilab.org/modeller
2. http://autodock.scripps.edu
3. http://biosig.unimelb.edu.au/pkcsm
4. https://profanderson.net/files/buildqsar.php
5. http://smoothdock.ccbb.pitt.edu/pharmer
6. https://www.statease.com/software/design-expert
7. www.rsc.org
8. https://ispso.unige.ch/labs/fanal/practical_hplc_simulator

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Practice School–Advanced Herbal Drug Technology

Course Title	Practice School - Advanced Herbal Drug Technology
Course Code	BPM463-PG
Course Type	Skill enhancement
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to develop the student skills in identification of medicinal plants; extraction and isolation of phytoconstituents, preparation and evaluation of herbal cosmetics and nano formulations. The student is also exposed to *in vitro* screening of herbal drugs including molecular docking studies of bio actives to assess their therapeutic activity.

2. Course Size and Credits:

Number of Credits	06
Credit Structure (Lecture: Tutorial: Practical)	0: 0: 12
Total Hours of Interaction	180
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	150 Marks **Component 1(CE): 25 Marks** Attendance - 4 Marks Student-Teacher Interaction – 6 Marks Assignment - 15 Marks **Component 2 (SEE): 125 Marks** Report submission -50 Marks Presentation - 75Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Acquire knowledge to recognize medicinal plant species and apply suitable techniques to identify and characterize phytoconstituents
- **CO-2** Formulate and evaluate novel herbal formulations
- **CO-3** Perform in vitro assays and computational studies

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

4. Course Contents

Unit 1 : Field visits

Understanding the biodiversity; Identification, collection and authentication of various plant species using Floras in their natural/conserved habitat by field visits, Herbarium preparation/ Development of medicinal plant garden

40 Hours

Unit 2: Concepts of Phytochemistry

Conventional and modern methods of extraction, isolation and characterization of phytoconstituents; Bio-assay guided fractionation of natural products, Hands on training on chromatographic techniques

40 Hours

Unit 3: Preparation and evaluation of herbal cosmetics

Skin care, hair care, dentifrices and Nutraceuticals, Nanotechnology: Applications, types, preparation and characterization of nanoparticles/nano formulations, Novel drug delivery for herbal drugs: Preparation and characterization of Phytosomes, Herbosomes

40 Hours

Unit 4: Pharmacological screening of herbal drugs

In vitro assays – Antioxidant, antimicrobial, anti-inflammatory, anti diabetic etc, Hands on training on molecular docking studies of phytoconstituents for their pharmacological activity prediction using software's

30 Hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		3	3					3			2	3	
CO-2		3	3					3			2		2
CO-3		3	3	3				3			3		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		7
1.Demonstration using Videos	2	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	5	
Tutorials		
Practical Work		115
1. Course Laboratory	105	
2. Computer Laboratory	10	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		28
1. Case Study Presentation	00	
2. Guest Lecture	02	
3. Industry / Field Visit	24	
4. Brain Storming Sessions	00	
5. Group Discussions	02	
6. Discussing Possible Innovations	00	
Presentations		5
Total Duration in Hours		**185**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (17% Weightage)			Component 2: SEE (83% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Teacher Student Interaction	Assignment	Report submission and Presentation 50+75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Staff- Student interaction: 06 Marks

1C: Assignment: Student is required to submit 1 word processed assignment which is set for 30 marks at the end of 14th week and the marks scored will be reduced to 15 marks.

Component - 2: 125 marks

A report has to be submitted at the end of the practice school for maximum of 50 marks and a presentation will be conducted for maximum of 75 marks.

Both components will be evaluated by course leader/s.

Evaluation of Report:

Objectives carried out and its outcomes	25 marks
Conclusion of work	25 marks
Total Marks	**50 marks**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Evaluation of Presentation:

Presentation of work	25 marks
Communication skills	25 marks
Question and answer skills	25 marks
Total Marks	**75 Marks**

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	Course Laboratory/work
7.	Group Work	Course Laboratory/work
8.	Self-Learning	Course Laboratory/work
9.	Written Communication Skills	Course Laboratory/work
10.	Verbal Communication Skills	Course Laboratory/work
11.	Presentation Skills	Course Laboratory/work
12.	Behavioral Skills	Course Laboratory/work
13.	Information Management	Course Laboratory/work
14.	Personal Management	Course Laboratory/work
15.	Leadership Skills	Group work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

9.Course Resources

a. Essential Reading

1. Herbal Drug Technology, Agarwal S S, Paridhavi M., University Press.
2. Medicinal Natural Products, Dewick Paul M., Wiley India Pvt Ltd.
3. Quality Control of Herbal Drugs, Pulok Mukherjee, K. Business Horizons Pharmaceutical Publishers, New Delhi.
4. Introduction to Novel Drug Delivery Systems, Jain, NK, Vallabh Publishers, New Delhi.
5. Natural Products: A Lab Guide, Raphael and Ikan, Academic Press.
6. Screening methods in Pharmacology, Turner Robert, A., Academic press, New York
7. Practical Pharmaceutical Chemistry. Part I and II, Beckett, AH and Stenlake, JB., CBS Publishers and Distributors, New Delhi
8. Trease and Evans Pharmacognosy, Evans, WC., Saunders Elsevier: Elsevier India Pvt Ltd, New Delhi
9. Thin Layer Chromatography, Stahl Egon., Springer, New York
10. Phytochemical Methods-A Guide to Modern Techniques of Plant Analysis, Harborne, JB., Chapman and Hall, London

b. Recommended Reading

a. An Advanced Textbook on Biodiversity Principles and Practice, K. V. Krishnamurthy, Oxford & IBH Publishing C. Pvt. Ltd., New Delhi
b. Flora of the Presidency of Madras, Gamble J.S., Bishen Singh Mahendra Pal Singh

c. Magazines and Journals

1. Journal of Natural Products
2. Pharmacognosy Magazine
3. Indian Journal of Natural Product and Resources
4. Journal of Ayurveda and Integrative Medicine
5. Evidence-Based Complementary and Alternative Medicine
6. Journal of Ethnopharmacology

d. Websites

1. www.pubmed.com
2. www.sciencedirect.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Practice School - Animal Facility Management and Pharmacological Screening Techniques

Course Title	Practice School: Animal Facility Management and Pharmacological Screening Techniques
Course Code	BPM463-PL
Course Type	Skill Enhancement
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

The aim of this course is to promote the humane care of animals used in education and biomedical research among the students emphasizing animal well-being, quality in the quest of advancement of biological knowledge relevant to humans and animals. Students are also trained to design animal experiments and evaluate drugs with appropriate parameters.

2. Course Size and Credits:

Number of Credits	06
Credit Structure (Lecture: Tutorial: Practical)	0:0:12
Total Hours of Interaction	180
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	150 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Interaction with student: 6 Marks 1C: Assignment: 15 Marks **Component 2 (SEE): 125 Marks** Report submission: 50 Marks Presentation: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the basic requirements, documentation, and regulatory guidelines for the establishment and maintenance of an animal house
- **CO-2** interpret the roles and responsibilities of CPCSEA and Institutional Animal Ethics Committee in animal research
- **CO-3** Analyze the functional areas and operational aspects of an animal facility in relation to animal care and research activities

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

CO-4 Apply and design experimental protocols for drug testing on laboratory animals in accordance with ethical guidelines and alternative methods

4. Course Contents

Unit 1:

a. Basic documents and requirements for animal house establishment
b. CPCSEA specification on animal husbandry
c. Record keeping — **25 hours**

Unit 2:

a. Animal house - Social environment and SOPs
b. CPCSEA and constitution of ethical committees- role and responsibility — **25 Hours**

Unit 3:

a. Animal facility-functional areas
b. Lab animals- Physiological and nutritional data — **30 hours**

Unit 4:

CPCSEA Guidelines

a) Veterinary care
b) Animal procurement and quarantine
c) Animal care and technical personnel
d) Guidelines for use of anesthesia — **30 Hours**

Unit 5:

Drug testing on lab animals – General

a) Toxicity studies
b) Behavioral studies
c) Experiments on CNS drugs
d) Experiments on CVS related drugs
e) Experiments on Respiratory drugs — **30 Hours**

Unit 6:

a. 3 R's for animal testing
b. Alternatives to animal testing — **10 Hours**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			2						3			3	
CO-2									3	2		3	
CO-3			3	2								3	
CO-4			3							2	2	3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		15
1. Demonstration using Videos	0	
2. Demonstration using Physical Models / Systems	5	
3. Demonstration on a Computer	10	
Tutorials		
Practical Work		120
1. Course Laboratory	120	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		15
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Presentations		5
Total Duration in Hours		**185**

7. Course Assessment and Reassessment

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (17% Weightage)			Component 2: SEE (83% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 125 Marks
Maximum Marks	4	6	15	
CO-1			X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Staff - student interaction: 6 marks.

1C. Assignment: Student is required to submit an assignment report for 15 marks

Component - 2: 125 marks

A report has to be submitted at the end of the Practice school for maximum of 50 marks and a presentation will be conducted for maximum of 75 marks and evaluated by concerned course leader.

Part -A: Evaluation of Report

Objectives and Outcomes	25 marks
Conclusion of work	25 marks

Part -B: Evaluation of Presentation

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Presentation of work	25 marks
Communication skills	25 marks
Viva-voce	25 marks

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	Course Laboratory/work
7.	Group Work	Course Laboratory/work
8.	Self-Learning	Course Laboratory/work
9.	Written Communication Skills	Course Laboratory/work
10.	Verbal Communication Skills	Course Laboratory/work
11.	Presentation Skills	Course Laboratory/work
12.	Behavioral Skills	Course Laboratory/work
13.	Information Management	Course Laboratory/work
14.	Personal Management	Course Laboratory/work
15.	Leadership Skills	Course Laboratory/work

9. Course Resources

a. Class Notes

b. Essential Reading

1. O'Rourke, D.P., and T.W.Schultz. 2002. Biology and diseases of amphibians. In Laboratory Animal Medicine, ed. J.G.Fox, L.C.Anderson, F.M.Loew, and F.W.Quimby, 793–826. San Diego: Academic Press.
2. Reuter, J.D., and R.C.Dysko. 2003. Quality assurance/surveillance monitoring programs for rodent colonies. In Laboratory Animal Medicine and Management, ed. J.D.Reuter and M.A.Suckow. Ithaca, NY:

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

International Veterinary Information Service.

3. Guidelines on the regulation of scientific experiments on animals Ministry of Environment & Forests (Animal Welfare Division) Government of India.
4. Vogel, H. Gerhard, - Drug discovery and evaluation: pharmacological assays, published by Springer-Verlag Berlin Heidelberg New York in 1997

c. Recommended Reading

1. AALAS (American Association for Laboratory Animal Science). 2014. 2014 Laboratory Animal Facility Compensation Survey. Dublin, OH: Industry Insights, Inc.
2. Andrews-Kelly, G.2014. Laboratory animal enrichment: Bridging compliance with science. Presented at the Public Responsibility in Medicine and Research Conference, Denver, Colorado.
3. CDC-NIH (Centers for Disease Control and Prevention" "National Institutes of Health). 2009. Biosafety in Microbiological and Biomedical Laboratories. 5th ed. Washington, DC: U.S. Department of Health and Human Services.

d. Magazines and Journals

1. Indian drugs
2. Indian journal of pharmaceutical sciences
3. Journal of the American Association

e. Websites

1. www.sciencedirect.com
2. Wikipedia and google.com
3. www.ncbi.nlm.nih.gov
4. www.elsevier.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Practice School - Pharmacy Practice

Course Title	Practice School – Pharmacy Practice
Course Code	BPM463-PP
Course Type	Skill Enhancement
Department	Pharmacy Practice
Faculty	Pharmacy

1. Course Summary

The aim of this course is to educate on phases of clinical trials and study designs for effective execution of projects alongside protocol preparation. Students are also trained to identify, organize and analyze different research reports based on various guidelines and strives to inculcate the skills of answering drug information queries, performing pharmacovigilance activities, identification as well as reporting of medication errors, counselling to improve compliance of the patient and interpretation of laboratory data

2. Course Size and Credits:

Number of Credits	06
Credit Structure (Lecture: Tutorial: Practical)	0:0:12
Total Hours of Interaction	180
Number of Weeks in a Semester	15
Department Responsible	Pharmacy Practice
Total Course Marks	150 **Component 1(CE): 25 Marks** 1A: Attendance: 4 Marks 1B: Student-Teacher Interaction: 6 Marks 1C: Assignment: 15 Marks **Component 2 (SEE): 125 Marks** Report submission: 50 Marks Presentation: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Analyze and summarize drug information through critical evaluation of literature
- **CO-2** Demonstrate knowledge of clinical trials and appraise scientific research for technical writing
- **CO-3** Analyze and interpret clinical cases and laboratory test results for patient care
- **CO-4** Identify, assess, monitor, report, and manage adverse drug reactions, medication errors, and design basic research protocols

4. Course Contents

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Unit 1 Clinical Research:
Introduction to clinical trials, ICH-GCP guidelines, various phases of clinical trial, hands-on training in preparation of protocol

40 hours

Unit 2 Technical Writing:
Structure and organization of research reports, Critical appraisal of research reports, Referencing using End Note and Mendeley, Hands on training on article writing

40 hours

Unit 3 Basics of Pharmaceutical Care:
Patient counselling, Medication history interview, SOAP notes, First aid, Function tests, Drug information queries

40 hours

Unit 4 Basics of Drug related problems:
Analyze the clinical cases and report ADRs, MEs and drug interactions

30 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		2	1		1						3	2
CO-2	3		2	2		1						3	3
CO-3	2		3	1		3						3	2
CO-4	3		3	2		3						3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		105
1. Demonstration using Videos	15	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	90	
Tutorials		
Practical Work		25
1. Course Laboratory	20	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Clinical Laboratory	00	
5. Hospital	05	
6. Model Studio	00	
Others		
1. Case Study Presentation	07	20
2. Guest Lecture	00	
3. Industry / Field Visit	03	
4. Brain Storming Sessions	03	
5. Group Discussions	07	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**185**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (17% Weightage)			**Component 2: SEE (83% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Teacher Student Interaction**	**Assignment**	**Report submission and Presentation 50+75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		**X**	**X**	**X**
CO-2		**X**	**X**	**X**
CO-3		**X**	**X**	**X**
CO-4		**X**	**X**	**X**
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

1B. Student-Teacher Interaction: 6 marks

1C. Assignment: Student is required to submit 1 word processed assignment which is set for 30 marks at the end of 14th week and the marks scored will be reduced to 15 marks.

Component - 2: 125 marks
A report has to be submitted at the end of the Practice school for maximum of 50 marks and a presentation will be conducted for maximum of 75 marks. Both components will be evaluated by concerned course leader/s

Part -A: Evaluation of Report

Objectives and Outcomes	25 marks
Conclusion of work	25 marks

Part -B: Evaluation of Presentation

Presentation of work	25 marks
Communication skills	25 marks
Viva-voce	25 marks

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	Course Laboratory/work
7.	Group Work	Course Laboratory/work
8.	Self-Learning	Course Laboratory/work
9.	Written Communication Skills	Course Laboratory/work
10.	Verbal Communication Skills	Course Laboratory/work
11.	Presentation Skills	Course Laboratory/work
12.	Behavioral Skills	Course Laboratory/work
13.	Information Management	Course Laboratory/work
14.	Personal Management	Course Laboratory/work
15.	Leadership Skills	Course Laboratory/work

9. Course Resources

a. Essential Reading

1. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.
2. Research methodology, methods and techniques, C R Kothari, Second edition, New Age International (P) Limited publishers. ISBN (13) : 978-81-224-2488-1
3. Parthasarathi, G., Hansen, N.K. and Nahata, M.C. (2012) A text book of Clinical Pharmacy Practice; Essential Concepts and Skills. 2nd Edition. Chennai: Orient Langram Pvt. Ltd.
4. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc.
5. Health Education and Community Pharmacy by N.S.Parmar.
6. Clinical pharmacy and therapeutics – Eric T Herfindal, Williams and Wilkins and Wilkins Publication
7. Koda-kimble, M.A., Alldredge, B.K., Corelli, R.L., Ernst, M.E., Guglielmo, B.J., Jacobson, P.A., Kradjan, W.A. and Williams, B.R. (2013) Applied Therapeutics. The Clinical use of Drugs. 10th Edition. Philadelphia: Lippincott Williams and Wilkins Publication.

b. Recommended Reading

1. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons
2. Brian, L.S. and Kimmel, L.S. (2007) Textbook of Pharmacoepidemiology. London: John wiley and sun Ltd.
3. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia
4. Comprehensive Pharmacy Review – Edt. Leon Shargel. Lippincott Williams & Wilkins.
5. Applied therapeutics: the clinical use of drugs. Lloyd Young and koda-kimble MA [ISBN 0-33365881-7].
6. Preston. (2013) Stockley's Drugs Interaction, London: Pharmaceutical Press

c. Magazines and Journals

1. The lancet
2. Indian Journal of pharmacy practice
3. Journal of Pharmacy Practice
4. Integrated Pharmacy Research and Practice
5. International Journal of Clinical Pharmacy
6. Journal of Clinical Epidemiology

d. Websites

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

1. www.medscape.com
2. www.ovid.com
3. www.micromedex.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Practice School – Pharmaceutical Manufacturing Science

Course Title	Practice School - Pharmaceutical Manufacturing Science
Course Code	BPM463-PS
Course Type	Skill enhancement
Department	Pharmaceutics
Faculty	Pharmacy

1. **Course Summary**

The aim of this course is to develop the skills in pharmaceutical formulation development including tablet manufacturing and evaluation process, preparation of batch manufacturing records and standard operating procedures for equipments, designing of experiments using softwares, operation of freeze dryer, homogenizer, fluidized bed dryer, and Kalweka equipments, preparation of nanoparticles, developing OTC products and knowledge of current trends in pharmaceutical packaging technology

2. **Course Size and Credits:**

Number of credits	06
Credit Structure (Lecture: Tutorial: Practical)	0:0:12
Total hours of Classroom interaction during the semester	180
Number of semester weeks	15
Department responsible	Pharmaceutics
Course marks	**Total Marks: 150** **Component** **1(CE): 25Marks** Part A: Attendance: 25 Marks **Component 2 (SEE): 125 Marks** Report submission - 50 marks Presentation - 75 marks
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Course Outcomes (CO)

After undergoing this course student will be able to:

CO-1	Understand and perform tablet manufacturing processes including packaging technology
CO-2	Operate advanced instruments like freeze dryer and fluidized bed dryer for dosage form development
CO-3	Design and analyze experiments using software tools
CO-4	Develop and analyse micro- and nanoparticulate drug delivery systems

4. Course Contents

Unit 1

Concepts and approaches in formulation development of dosage forms. SOPs importance and creation for equipments and instruments. BMR preparation for various pharmaceutical formulations.

Hands on training on pilot batch manufacture of tablets. Hands on training on various quality control evaluation of tablets as per Indian Pharmacopoeia

40 hours

Unit 2

Fundamentals and applications of tray drying and Fluidized bed drying process
Concepts and training in Freeze drying process using suitable samples

40 Hours

Unit 3

Software based learning – Designing and performing experiments using Design Expert software.
Hands on training on development of semisolids by applying DoE concepts

40 Hours

Unit 4

Concept and development of nanoparticle formulation using probe sonicator
Packaging technology in pharmaceuticals – Conventional and latest packaging materials, types, Hands on training on quality control tests for packaging materials

30 Hours

6. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3	2		2					1	3	1
CO-2			2	3		2					1	3	2
CO-3			3	3							2	2	3
CO-4			3	2		1					2	2	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		15
1. Demonstration usingVideos	05	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer	10	
Tutorials		
Practical Work		120
1. Course Laboratory	120	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital/ Pharmacy		
6. Model Studio		
Others		15
1. Case Study Presentation	5	
2. Guest Lecture		
3. Hospital Visit/ Pharmacy		
4. Brain Storming Sessions	5	
5. Group Discussions	5	
6. Discussing Possible Innovations		
Examination		5
Total Duration in Hours		**185**

8. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	75 Marks
Maximum Marks	4	6	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 or SC4 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Staff - student interaction: 6 marks.
1C. Assignment: Student is required to submit 1 word processed assignment which is set for 30 marks at the end of 14th week and the marks scored will be reduced to 15 marks.

Component - 2: 125 marks
A report has to be submitted at the end of the Practice school for maximum of 50 marks and a presentation will be conducted for maximum of 75 marks and evaluated by concerned course leader/s.

Evaluation of Report:

Objectives carried out and its outcomes	25 marks
Conclusion of work	25 marks
Total Marks	**50 marks**

Evaluation of Presentation:

Presentation of work	25 marks
Communication skills	25 marks

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Question and answer skills	25 marks
Total Marks	**75 Marks**

Reassessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

9. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	Course Laboratory/work
7.	Group Work	Course Laboratory/work
8.	Self-Learning	Course Laboratory/work
9.	Written Communication Skills	Course Laboratory/work
10.	Verbal Communication Skills	Course Laboratory/work
11.	Presentation Skills	Course Laboratory/work
12.	Behavioral Skills	Course Laboratory/work
13.	Information Management	Course Laboratory/work
14.	Personal Management	Course Laboratory/work
15.	Leadership Skills	Group work

9. Course Resources

a. Essential Reading

1. Theory & Practice of Industrial Pharmacy, L. Lachman, Varghese Publication, Bombay.
2. Modern Pharmaceutics, G.S. Banker and C.T. Rhodes, Marcel Dekker, NY.
3. Physical Characterization of Pharmaceutical Solids, H. G. Brittain, Marcel Dekker, NY.
4. Physical Pharmacy, A. Martin, Lea and Febiger, Philadelphia.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Pharmaceutical dissolution testing, U.V. Banaker, Marcel Dekker, Inc., New York.
6. Pharmaceutical Dosage Forms : Parenteral Medications, Avis K. E., Leon Lachman and H. Lieberman, Marcel Dekker, New York
7. Pharmaceutical Dosage Forms : tablets, Lieberman H. A. and Leon Lachman, Marcel Dekker, New York

b.Recommended Reading

1. Good Manufacturing Practice for pharmaceuticals, Sidney H. Willing, Marcel Decker Inc.
2. Remington: The science and practice of pharmacy.
3. James Swarbrick, James C. Boylan, Encyclopedia of Pharmaceutical Technology, Marcel Dekker, III.
4. Encyclopedia of controlled release technology

c.Magazines and Journals

1. Drug development and industrial pharmacy
2. Journal of controlled release
3. Journal of drug delivery science and technology
4. Indian drugs
5. Indian journal of pharmaceutical sciences

d.Websites

www.pharmtech.com
www.dissolutiontechnolgies.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

SEMESTER 8

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Biostatistics & Research Methodology Theory

Course Title	Biostatistics and Research Methodology Theory
Course Code	BPC464
Course Type	Core Theory
Department	Pharmacy Practice
Faculty	Pharmacy

1. Course Summary

The aim of this course is to provide the fundamental concepts of research methodology, statistical methods of analysis and in the interpretation of data for its application in pharmacy.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacy Practice
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Recognize the importance of biostatistics and research methodology in pharmacy
- **CO-2** Identify appropriate hypothesis, sampling, errors and suitable statistical methods for data analysis
- **CO-3** Demonstrate the operation of M.S. Excel, SPSS, R and MINITAB®, DOE (Design of Experiment) in industry and clinical trials
- **CO-4** Discuss the graphs, methods of collection of data and its analysis and interpretation

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 Introduction: Statistics, Biostatistics, Frequency distribution
Measures of central tendency: Mean, Median, Mode - Pharmaceutical examples
Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems **Correlation:** Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

5 hours

Unit 2 Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples
Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples
Parametric test: t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference

15 hours

Unit 3 Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test
Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism
Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph
Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

15 hours

Unit 4 Blocking and confounding system for Two-level factorials. Regression modeling: Hypothesis testing in Simple and Multiple regression models
Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach

5 hours

Unit 5 Design and Analysis of experiments: Factorial Design: Definition, design, advantage of factorial design response
Surface methodology: Central composite design, historical design, optimization techniques

4 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	2		3	3							3	3	3
CO-2	2		3	3							3	3	3
CO-3	3		3	3							3	3	3
CO-4	3		3	3							3	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos		
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	05	
Tutorials		15
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		05
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm. Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2, SC3 or SC4), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Classroom lectures, Self-study
3.	Critical Skills	Assignment
4.	Analytical Skills	Assignment
5.	Problem Solving Skills	Assignment, Examination
6.	Practical Skills	Assignment
7.	Group Work	--
8.	Self-Learning	Self-study
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	--
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

1. Machin, D., Campbell, M.J., Walters, S.J . (2006) Medical Statistics- A Textbook for the Health Sciences, 4th Edition, England: Wiley publications.
2. Fathalla, M .F. (2011) A practical Guide for health researchers, WHO Regional Publications Eastern Mediterraanean Series, WHO.
3. Bonita, R., Beagleshole R., Kjellstrom, T. (2007) Basic Epidemiology, 2nd Edition, WHO.
4. Armitage, P., Berry, G., Mathews, J .N .S. (2002) Statistical Methods for Medical Research, 4th Edition, USA: Blackwell science ltd.

b. Recommended Reading

a. S Bolton., Charles Bon. (2004) Pharmaceutical Statistics- Practical and Clinical Applications, 4th Edition, USA: Dekkar Media.

c. Magazines and Journals

1. International Journal of Biostatistics
2. Journal of Clinical Trials

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. International Journal of Epidemiology.

d. Websites

1. www.sciencedirect.com
2. www.pubmed.com
3. www.medscape.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Social and Preventive Pharmacy Theory

Course Title	Social and Preventive Pharmacy Theory
Course Code	BPC465
Course Type	Core Theory
Department	Pharmacy Practice
Faculty	Pharmacy

1. Course Summary

This course deals with social and health education. This course is designed to impart fundamental knowledge on the concept of health and disease. This course also provides knowledge on National Health Programmes and the role of pharmacist in relation to preventive medicine and community services.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacy Practice
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain the concepts of health, disease, prevention, nutrition, hygiene, and socio-cultural factors influencing health and illness
- **CO-2** Elaborate on the principles of preventive medicine and outline the causes, transmission, prevention, and control measures of common communicable and non-communicable diseases
- **CO-3** Discuss the objectives, organization, and functioning of major National Health Programs in India
- **CO-4** Appraise the structure and role of community health services, including primary health care, rural and urban health programs, school health services, and maternal and child health programs

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1:

Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health.

Hygiene and health: Personal hygiene and health care; avoidable habits.

10 hours

Unit 2 Preventive medicine:

General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

10 hours

Unit 3 National health programs, its objectives, functioning and outcome of the following:

HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

10 hours

Unit 4 National health intervention programme:

Programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program.

08 hours

Unit 5 Community services in rural, urban and school health

Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

07 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3		2			2			3			3	
CO-2	3		3			2			3			2	
CO-3	3		2			3			3			2	
CO-4	3		2			3			3			3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications

b. Recommended Reading

1. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
2. Park Textbook of Preventive and Social Medicine, K Park, 21 st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
3. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

c. Magazines and Journals

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland
2. Indian Journal of Pharmaceutical Sciences

d. Websites

a. https://main.mohfw.gov.in/

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharma Marketing Management Theory

Course Title	Pharma Marketing Management Theory
Course Code	BPE466
Course Type	Elective Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The course aims to provide an understanding of marketing concepts and techniques with their applications in the pharmaceutical industry. The curriculum involves fostering the acquisition of knowledge and skills required to excel in the areas of value added services and pharmaceutical marketing covering distribution, promotion, pricing and sale of products.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the fundamental concepts of marketing, marketing mix, marketing channels, market research, and emerging trends in pharmaceutical marketing

CO-2 Outline the principles of product management, brand management, and pricing strategies of pharmaceutical products

CO-3 Discuss the principles, concepts, and strategic applications of management and marketing in

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

the pharmaceutical sector, including leadership and decision-making aspects

CO-4 Demonstrate knowledge of promotional methods, sales techniques, communication strategies, and ethical professional practices in pharmaceutical marketing

4. Course Contents

Unit 1 (Marketing): Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

Pharmaceutical market:
Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation & targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.

10 hours

Unit 2 (Product Decision):
Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product development/decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry

10 hours

Unit 3 (Promotion):
Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products

10 hours

Unit 4 (Pharmaceutical marketing channel):
Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR):
Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR

08 hours

Unit 5 (Pricing):
Importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).

Emerging concepts in marketing:
Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing

Contemporary topics:

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Pharmacoeconomics, Health policy and various components of the Indian health care system, Business analytics, Lean Operations Management **07 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		2	3				3					3	
CO-2			3									3	
CO-3		3	3		3							3	
CO-4		2	2			3						3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems	2	
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 Marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by the concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Kotler, P., Keller, K., Manceau, D. and Hemonnet-Goujot, A. (2015) Marketing management. 1st ed. Montreuil: Pearson France.
2. Grewal, D. (2012). Marketing. 1st ed. [Place of publication not identified]: Grupo A - Amgh.
3. Winer, R. and Dhar, R. (2014). Marketing management. 1st ed. Harlow, Essex: Prentice Hall.
4. Saxena, R. (2010). Marketing Management. 1st ed. New Delhi: Tata McGraw-HillL Education Private Limited.
5. Walker, O., Boyd, H. and Larréché, J. (1999). Marketing strategy. 1st ed. Boston, Mass.: Irwin/McGraw-Hill

c. Recommended Reading

1. Neuland, E., Erwee, R., Daniels, J., Radebaugh, T. and Hough, J. (2000). Global business: environments and strategies. 1st ed. Cape Town, RSA: Oxford University Press Southern Africa.
2. Chaganti, S. (2006). Pharmaceutical marketing in India. 1st ed. Visakhapatnam:

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Registrar
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Published by Gitam Institute of Foreign Trade, in association with Excel Books

d. Magazines and Journals

1. Economic times. New Delhi, Bennett, Coleman & Co. Ltd.
2. Pharma Times. Indian Pharmaceutical Association, Mumbai.
3. Express Pharma. New Delhi, The Media Ant.
4. Marketing Insight by the American Marketing Association.

e. Websites

1. www.pharmaceuticalcommerce.com
2. www.digitalpharmaseries.com
3. www.pharmamanufacturing.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmaceutical Regulatory Science Theory

Course Title	Pharmaceutical Regulatory Science Theory
Course Code	BPE467
Course Type	Elective Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

The aim of this course is to introduce the concepts of new drug discovery, development and clinical trials in India and overseas. This course also emphasizes on the regulatory requirements for registration of Indian drug product in overseas.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Analyze the stages of development, and global regulatory approval processes
- **CO-2** Apply modern regulatory tools and documentation systems such as DMF, CTD, eCTD
- **CO-3** Evaluate ethical principles in clinical trials, including informed consent, GCP guidelines, and pharmacovigilance
- **CO-4** Develop the ability to continuously update knowledge on evolving global regulatory guidelines and approval pathways

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1 (New Drug Discovery and development):

Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

10 hours

Unit 2 (Regulatory Approval Process and Regulatory authorities and agencies):

Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.

Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

10 hours

Unit 3 (Registration of Indian drug product in overseas market):

Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research

10 hours

Unit 4 (Clinical trials):

Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

08 hours

Unit 5 (Regulatory Concepts):

Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3									3	
CO-2				3								3	
CO-3							3					3	
CO-4											3		3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	05	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Numeracy or Tutorials		
1. Solving numerical problems		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		×	×	×
CO-2		×	×	×
CO-3		×	×	×
CO-4		×	×	×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by the concerned course leader/s.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a.Class Notes

b.Essential Reading

1. Sachin Itkar, Dr. N.S. Vyawahare (2011) Drug Regulatory Affairs, Nirali Prakashan, Pune
2. Ira R. Berry, Robert P. Martin, (2004) The Pharmaceutical Regulatory Process, Second Edition Edited by Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers.
3. Richard A Guarino, (1993) New Drug Approval Process: Accelerating Global Registrations, 5th edition, Drugs and the Pharmaceutical Sciences.
4. Sandy Weinberg (2008) Guidebook for drug regulatory submissions. John Wiley & Sons. Inc.
5. Douglas J. Pisano, David Mantus. (2005) FDA Regulatory Affairs: a guide for prescription drugs, medical

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

devices, and biologics, Marcel Dekker Inc
6. Leon Shargel, Isader Kaufer (2004) Generic Drug Product Development, Solid Oral Dosage forms, Marcel Dekker series.
7. Fay A. Rozovsky, Rodney K. Adams (2003) Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance, John Wiley & Sons. Inc.
8. John I. Gallin, Frederick P. Ognibene (2002) Principles and Practices of Clinical Research, Second Edition, Elsevier.

c.Recommended Reading

a. W.H.O (2007) Quality assurance of pharmaceuticals: A compendium of guidelines and related materials: Volume 2: Good manufacturing practices and inspection. 2 nd ed. Geneva: World Health Organization.
b. Sharma PP. (2015) How to Practice GMP's, 6th Edition. Agra: Vandana Publications, New Delhi.

d.Magazines and Journals

a. Clinical research and Regulatory Affairs; Published by Taylor and Francis Online
b. International Journal of Drug Regulatory Affairs; Published by the Society of Pharmaceutical Technocrats (SoPhTech)
c. Pharmaceutical Regulatory Affairs: Open Access; Published by OMICS International

e. Websites

1. www.ich.org
2. www.fda.gov
3. https://www.tga.gov.au

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Pharmacovigilance Theory

Course Title	Pharmacovigilance Theory
Course Code	BPE468
Course Type	Elective Course
Department	Pharmacy Practice
Faculty	Pharmacy

1. Course Summary

This course deals with the basic terminologies and global scenario of pharmacovigilance and imparts knowledge on pharmacogenomics. It also imparts knowledge on international classification of diseases and generation of safety data for drugs and vaccines.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacy Practice
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the principles, history, scope, and regulatory framework of pharmacovigilance including global (WHO) and national systems (PvPI), along with standard terminologies used in drug safety

CO-2 Apply drug and disease classification systems, coding dictionaries, and information resources for pharmacovigilance practice and program establishment.

CO-3 Evaluate adverse drug reactions and vaccine-related safety events using detection methods, causality assessment, surveillance strategies, and risk communication approaches.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

CO-4 Analyze pharmacovigilance data generation and regulatory requirements across preclinical, clinical, and post-marketing phases, including ICH guidelines, CIOMS, pharmacogenomics, and special populations.

4. Course Contents

Unit 1 Introduction to Pharmacovigilance:

History and development of Pharmacovigilance, Importance of safety monitoring of Medicine, WHO international drug monitoring programme, Pharmacovigilance Program of India (PvPI)

Introduction to adverse drug reactions

Definitions and classification of ADRs, Detection and reporting, Methods in Causality assessment, Severity and seriousness assessment, Predictability and preventability assessment, Management of adverse drug reactions

Basic terminologies used in Pharmacovigilance

Terminologies of adverse medication related events, Regulatory terminologies.

10 hours

Unit 2 Drug and disease classification:

Anatomical, therapeutic and chemical classification of drugs, International classification of diseases, Daily defined doses, International Nonproprietary Names for drugs Drug dictionaries and coding in Pharmacovigilance, WHO adverse reaction terminologies, MedDRA and Standardised, MedDRA queries, WHO drug dictionary, Eudravigilance medicinal product dictionary Information resources in pharmacovigilance, Basic drug information resources, Specialised resources for ADRs Establishing pharmacovigilance programme, Establishing in a hospital, Establishment & operation of drug safety department in industry, Contract Research

Organisations (CROs), Establishing a national programme

10 hours

Unit 3 Vaccine safety surveillance:

Vaccine Pharmacovigilance, Vaccination failure, Adverse events following immunization Pharmacovigilance methods, Passive surveillance – Spontaneous reports and case series, Stimulated reporting, Active surveillance – Sentinel sites, drug event monitoring and registries, Comparative observational studies – Cross sectional study, case control study and cohort study, Targeted clinical investigations Communication in pharmacovigilance, Effective communication in Pharmacovigilance, Communication in Drug Safety Crisis management, Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media

10 hours

Unit 4 Statistical methods for evaluating medication safety data:

Safety data generation Preclinical phase, Clinical phase, Post approval phase, ICH Guidelines for Pharmacovigilance, Organization and objectives of ICH, Expedited reporting, Individual case safety reports, Periodic safety update reports, Post approval expedited reporting, Pharmacovigilance planning, Good clinical practice in pharmacovigilance studies

08 hours

Unit 5 Pharmacogenomics of adverse drug reactions

Drug safety evaluation in special population

Paediatrics, Pregnancy and lactation, Geriatrics

CIOMS

CIOMS Working Groups, CIOMS Form CDSCO (India) and Pharmacovigilance, D & C Act and Schedule Y, Differences in Indian and global pharmacovigilance requirements

07 hours

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Ramanath K.V.
Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3			1		2			2		1	3	1
CO-2	3			3		1			2		2	3	2
CO-3	3			2		2			3		2	3	2
CO-4	3			2		2			3		3	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer	2	
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1		**X**	**X**	**X**
CO-2		**X**	**X**	**X**
CO-3		**X**	**X**	**X**
CO-4		**X**	**X**	**X**
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Marks**
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

a. Class notes
b. Gupta, S.K., 2011. Textbook of Pharmacovigilance. Jaypee Brothers medical publishers (P) Ltd, Ed, 1, pp.21-27.
c. Cobert, B. and Biron, P., 2009. Practical drug safety from A to Z. Jones & Bartlett Publishers.
d. Andrews, E.B. and Moore., 2014. Mann's Pharmacovigilance. John Wiley & Sons.
e. Talbot, J. and Waller, P., 2004. Stephens' detection of new adverse drug reactions. John Wiley & Sons.
f. Waller, P., 2010. An introduction to pharmacovigilance. Wiley-Blackwell Giacomelli, B., 2011. Cobert's Manual of Drug Safety and Pharmacovigilance. American Journal of Health-System Pharmacy, 68(23), pp.2297-2301.

b. Recommended Reading

1. Munjal, Y.P. and Sharm, S.K., 2012. API Textbook of Medicine, Two Volume Set. JP Medical Ltd.
2. Lindquist, M., 2004. Data quality management in pharmacovigilance. Drug safety, 27(12),

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

pp.857-870.

c. Magazines and Journals

1. Drug Safety
2. Pharmacoepidemiology and Drug safety.

d. Websites

a. http://www.whoumc.org
b. http://www.ich.org c
c. http://www.cioms.ch
d. http://cdsco.nic.in
e. http://www.who.int/vaccine_safety/en
f. http://www.ipc.gov.in/PvPI/pv_home.htm

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Quality Control and Standardization of Herbals Theory

Course Title	Quality Control and Standardization of Herbals Theory
Course Code	BPE469
Course Type	Core Elective
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

The aim of this course is to impart knowledge on evaluation and standardization of herbs and herbal products. The course provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	70
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Identify quality control tests for drugs, herbal materials, and dosage forms.
CO-2 Explain quality assurance practices, cGMP, GAP, GLP, and WHO guidelines.
CO-3 Discuss regulatory guidelines, stability testing, and standardization techniques.
CO-4 Evaluate pharmacopoeial standards, and herbal drug regulations.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit I

Basic tests for drugs – Pharmaceutical substances (any five), Medicinal plants materials and dosage forms (at least for five different dosage forms), WHO guidelines for quality control of herbal drugs, evaluation of commercial crude drugs intended for use **10 hours**

Unit II

Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine, WHO Guidelines on current good manufacturing Practices (cGMP) for herbal Medicines, WHO Guidelines on GACP for Medicinal Plants **10 hours**

Unit III

EU and ICH guidelines for quality control of herbal drugs, Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines **10 hours**

Unit IV

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products, Preparation of documents for new drug application and export registration, GMP requirements and Drugs & Cosmetics Act provisions. **8 hours**

Unit V

Regulatory requirements for herbal medicines, WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias, Role of chemical and biological markers in standardization of herbal products. Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

7 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			2										2
CO-2							3						2
CO-3							3						2
CO-4							3						2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of Cos on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1		X	X	X
CO-2			X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.
Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a.Class Notes

b. Essential Reading

1. Evans, W.C. (2009) *Trease and Evans Pharmacognosy*. 16th ed. New Delhi: Saunders Elsevier: Elsevier India Pvt Ltd.
2. Kokate, C.K., Purohit, A.P, and Gokhale, S.B. (2010*) Pharmacognosy*. 45th ed. Pune: Nirali Prakashan.
3. Rangari, V.D. (2003) *Pharmacognosy and Phytochemistry*. Vol I&II. Nashik: Career Publications.
4. Mukherjee, P.W. (2002) *Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals*. New Delhi: Business Horizons Publishers.
5. Shinde, M.V., Dhalwal, K., Potdar, K. and Mahadik, K. (2009) Application of quality control principles to herbal drugs. *International Journal of Phytomedicine* 1, 4-8. 8.
6. WHO. (1998) *Quality Control Methods for Medicinal Plant Materials*, World Health Organization. Geneva : Guidelines for the Appropriate Use of Herbal Medicines.
7. WHO. (1981)*The International Pharmacopeia*. Vol. 2: Quality Specifications. 3rd ed. Geneva.
8. WHO. (1999) *Quality Control Methods for Medicinal Plant Materials*. Geneva: World Health Organization.
9. WHO. (2005) *WHO Global Atlas of Traditional, Complementary and Alternative Medicine*. Vol 1 and vol 2. Geneva: World Health Organization.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

10. WHO. (2004) *Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plant.* Geneva: World Health Organization.

c. Recommended Reading:

a. Wallis, T.E. (1996) *Text Book of Pharmacognosy.* 5th ed. New Delhi: CBS publishers

d. Magazines and Journals

1. Ayurvedic Drug Index-Chandigarh, 3M Advertisers and Publishers
2. Pharmacognosy Magazine-Wolters Kluwer - Medknow , Mumbai
3. Indian Journal of Natural Products and resources-CSIR, New Delhi

e. Websites

1. www.sciencedirect.com
2. www.pubmed.com
3. www.herbnet.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Computer Aided Drug Design

Course Title	Computer Aided Drug Design
Course Code	BPE470
Course Type	Elective Course
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to create awareness among students of computational methods in drug design and development. This course is designed to provide detailed knowledge of rational drug design process and techniques used in rational drug design process. This knowledge motivates the UG students to take up research projects based on QSAR and molecular modeling in R& D wings of pharmaceutical industry as well as at academic institutions in their future endeavors. The study includes virtual screening methodology.

2. Course Size and Credits:

Number of credits	4
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of weeks in a semester	16
Department responsible	Pharmaceutical Chemistry
Total Course marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the stages of drug discovery and development, rational drug design approaches, and analog-based drug design principles including bioisosterism.

CO-2 Analyze structure–activity relationships using QSAR techniques including physicochemical parameters, Hansch analysis, Free-Wilson models, and 3D-QSAR approaches (CoMFA, CoMSIA).

CO-3 Apply molecular modeling and virtual screening techniques such as pharmacophore mapping, molecular docking (rigid and flexible), and de novo drug design for lead identification.

CO-4 Evaluate computational tools, databases, and molecular modeling methods (MM, QM, energy minimization) for drug design and optimization in pharmaceutical research.

4. Course Contents

Unit 1 (Introduction to Drug Discovery and Development)

a. Stages of drug discovery and development
b. Lead discovery and Analog Based Drug Design
c. Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.
d. Analog Based Drug Design: Bio-isosterism, Classification, Bio-isosteric replacement. Any three case studies

Unit 2 (Quantitative Structure Activity Relationship (QSAR)
SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA

Unit 3 (Molecular Modeling and virtual screening techniques)
Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening, Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

Unit 4 (Informatics & Methods in drug design)
Introduction to Bioinformatics and cheminformatics. ADME databases, chemical, biochemical and pharmaceutical databases

Unit 5 (Molecular Modeling)
Introduction to molecular mechanics and quantum mechanics. Energy Minimization

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1											3	2	2
CO-2			3	2							2	3	2
CO-3			3	3							2	3	3
CO-4			2	3							3	2	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in	Total Duration in
Face to Face Lectures		40
Demonstrations		5
1. Demonstration using Videos	5	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		0
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			X	X
CO-2			X	X
CO-3			X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 word processed assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be moderated by the concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class notes**
b. **Essential Reading**

1. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York
2. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
3. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
4. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action"Academic Press, New York.
5. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger
6. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

c. Recommended Reading

1. Martin YC. "Quantitative Drug Design" Dekker, New York
2. Koro Ikovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
3. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore

d. Magazines and Journals

1. Journal of computational Chemistry –Wiley USA
2. Journal of theoretical and computational Chemistry –World Scientific,Califonia
3. Journal of molecular modeling –Springer,UK

e. Websites

1. http://www.ccl.net/chemistry/
2. http://www.vcclab.org IV.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Cell and Molecular Biology (Theory)

Course Title	Cell and Molecular Biology Theory
Course Code	BPE471
Course Type	Elective Course
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

Cell and molecular biology deals with the study of cells – their physiological properties, structure, the organelles they contain, interactions with their environment, life cycle, division, death and function. This course educates students on the physiology of cells with special reference to cellular functions at molecular level and the signaling pathways which prepares them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional exam: 15 Marks **Component 2 (SEE): 75 Marks** Semester End Examination: 75Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1.** Outline the composition, types, properties and reproduction of cell
- **CO-2.** Explain the functions of DNA/ RNA and the flow of molecular information
- **CO-3.** Explain protein structure, protein pathways and protein synthesis
- **CO-4.** Illuminate the basics of molecular genetic mechanisms and cell signaling
- **CO-5.** Discuss the clinical significance of cell signaling mechanisms

4. Course Contents

Unit 1:

a. Cell and Molecular Biology: Definitions theory and basics and Applications.
b. Cell and Molecular Biology: History and Summation.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

c. Properties of cells and cell membrane.
d. Prokaryotic versus Eukaryotic
e. Cellular Reproduction
f. Chemical Foundations – an Introduction and Reactions (Types) **10 hours**

Unit 2:

a. DNA and the Flow of Molecular Information
b. DNA Functioning
c. DNA and RNA
d. Types of RNA
e. Transcription and Translation **10 Hours**

Unit 3:

c. Proteins: Defined and Amino Acids
d. Protein Structure
e. Regularities in Protein Pathways
f. Cellular Processes
g. Positive Control and significance of Protein Synthesis **10 hours**

Unit 4:

a. Science of Genetics
b. Transgenics and Genomic Analysis
c. Cell Cycle analysis
d. Mitosis and Meiosis
e. Cellular Activities and Checkpoints **8 Hours**

Unit 5:

a. Cell Signals: Introduction
b. Receptors for Cell Signals
c. Signaling Pathways: Overview
d. Misregulation of Signaling Pathways
e. Protein-Kinases: Functioning **7 Hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3											3	
CO-2	2		2									3	
CO-3	2		3									3	
CO-4	1		3									3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		5
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document. The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			x	x
CO-2		x	x	x
CO-3		x	x	x
CO-4		x	x	x
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination.

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75 and both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

Dean
Faculty of Pharmacy
M.S Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	--------
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	------
11.	Presentation Skills	Assignment, examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

a. Denyer, S. P., Hodges, N. A., Gorman, S. P., Gilmore, B. F. (ed.) (2011) Hugo and Russell's
b. Pharmaceutical Microbiology. 8th edn. London: Wiley – Blackwell.
c. Reed, G. (2004) Prescott and Dunn's Industrial Microbiology. 4th edn. New Delhi: CBS Publishers & Distributors.
d. Chan, E. C. S., Pelczar, M. J., Kreig, N. R. (1977) Microbiology. 5th edn. USA:Tata McGraw-Hill Education Pvt. Ltd.
e. Harris, M. (1964) Pharmaceutical Microbiology. California: Balliere Tindall and Cox.
f. Jain, N. K. (2004) Pharmaceutical Microbiology. Delhi: Vallabh Prakashan.
g. Brenner, D. J., Kreig, N. R., Staley, J. T. (2005) Bergeys manual of systematic bacteriology. Germany: Springer Verlag.
h. Goldsby, R. A., Kindt, T. J., Osborne, B. A. (1999) Kuby Immunology. USA: WH Freeman & Co.

c. Recommended Reading

1. Rose, A. H. (1961) Industrial Microbiology. 3rd edn. UK: Butterworths.
2. Carter, S. J. (2005) Cooper and Gunn's: Tutorial Pharmacy. 6th edn. Delhi: CBS Publisher and Distributers.
3. Peppler, H. J. (1979) Microbial Technology. 2nd edn. USA: Academic Press.
4. Edward, A. L. (2001) Fundamentals of Microbiology. 6th edn. USA: Jones & Bartlett Publishers.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

d. Magazines and Journals

1. Journal of Molecular Biology. Amsterdam: Elsevier
2. Cellular and Molecular Biology. France: OMICS International
3. Molecular and Cellular Biology. US: American Society for Microbiology

e. Websites

1. www.mcb.asm.org; 2. www.scripps.edu

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Cosmetic Science Theory

Course Title	Cosmetic Science Theory
Course Code	BPE472
Course Type	Elective Course
Department	Pharmaceutics
Faculty	Pharmacy

1. Course Summary

This course is designed to impart basic knowledge on the range of cosmetics with due emphasis on the chemistry, formulations and manufacturing technologies with evaluation studies. The course enables the students in the right selection of cosmeceuticals for varied benefits.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmaceutics
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Identify factors influencing the selection and performance of skincare care products

CO-2 Justify the need for excipients in the formulation of cosmetics

CO-3 Appraise the role of botanicals in cosmetics

CO-4 Propose suitable formulation and evaluation methods for different classes of cosmetics

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1:
Classification of cosmetic and cosmeceutical products
Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs

Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.
Hair: Basic structure of hair. Hair growth cycle.

10 hours

Unit 2:
Principles of formulation and building blocks of skin care products:
Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals.

Anti-perspirants & deodorants- Actives & mechanism of action.

Principles of formulation and building blocks of Hair care products:
Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para-phylene diamine based hair dye.

Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash

10 hours

Unit 3:
Sun protection, Classification of Sunscreens and SPF.

Role of herbs in cosmetics:
Skin Care: Aloe and turmeric Hair care: Henna and amla.
Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin- cream and toothpaste.

10 hours

Unit 4
Principles of Cosmetic Evaluation:
Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties.

Soaps and syndet bars:
Evolution and skin benefits.

Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

08 hours

Unit 5

Oily and dry skin, causes leading to dry skin, skin moisturization. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes

Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.

10 hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1			3			3						3	
CO-2			3			3						3	
CO-3			3			3						3	
CO-4			3			3	3					3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		03
1.Demonstration using Videos	3	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		02
1. Case Study Presentation	02	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Discussing Possible Innovations	00	
Written Examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**
Maximum Marks	**4**	**6**	**15**	
CO-1			×	×
CO-2			×	×
CO-3			×	×
CO-4		×		×
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	**Marks**
95 – 100	**4**
90 – 94	**3**
85 – 89	**2**
80 – 84	**1**
Less than 80	**0**

1B. Assignment and Interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Component - 2: 75 marks
A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.
Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. **Class Notes**
b. **Essential Reading**

1. Moore, R.J. Wilkinson, J.B, (1982) *Harry's Cosmetology*. Los Angles: Chemical Publishing Company.
2. Vimaladevi,M.(2007) *Textbook of Cosmetics*. New Delhi: CBS.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Louis Appell. (1994) *The Formulation and Preparation of Cosmetics, Fragrances and Flavors*. Geneva: Micelle Press.
4. Sanju Nanda, Arun Nanda, Roop K Khar.(2011) *Cosmetic technology*. Delhi: Birla Publications (Regd) Pvt Ltd.
5. Mithal, B.M,Saha,R.N. (2014*) Handbook of Cosmetics*. New Delhi: Vallabh Publications / Prakashan.

c. Recommended Reading

1. Marvin S. Balsam, Edward Sagarin.(2008) *Cosmetics Science and Technology*. New Delhi: Wiley
2. Donald S. Orth, Jon J. Kabara, Stephen P. Denyer, S.K. Tan.(2006). *Cosmetics and Drug Microbiology*. London: CRC Press.
3. Bharath, S. (2012) *Pharmaceutical Technology- Concepts and Applications*, Asia: Pearson Publishers.
4. Drugs and Cosmetics Laws. *Universal's Legal Manual*. (2015). New Delhi: Universal Law Publishing.
5. Zoe Diana Draelos, Lauren A.Thaman. (2005) *Cosmetic Formulation of Skin Care Products*. USA: CRC Press.
6. Randy Schueller, Perry Romanowski.(2002) *Multifunctional Cosmetics*. Florida: CRC Press.

d. Magazines and Journals

1.International Journal of Cosmetic Science.
2.Journal of Cosmetics, Dermatological Sciences and Applications
3.Journal of Cosmetic science.

e. Websites

1. www.chemistscorner.com
2. www.cosmeticlearning.com
3. www.cosmeticsciencetechnology.com
4. www.cosmeticsdesign.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Experimental Pharmacology Theory

Course Title	Experimental Pharmacology Theory
Course Code	BPE473
Course Type	Elective Course
Department	Pharmacology
Faculty	Pharmacy

1. Course Summary

This course introduces students to the concepts of preclinical studies as a part of drug development process. This course familiarizes students with the regulatory requirements for the maintenance and experiments on laboratory animals, the design of preclinical studies, and conduct of experiment and interpretations of results which will prepare them for further study in the course discipline.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Pharmacology
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional exam: 15 Marks **Component 2 (SEE): 75 Marks** Semester End Examination: 75Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Outline CPCSEA and OECD guidelines and summarize the applications of commonly used laboratory animals
- **CO-2** Determine drug dosage and explain preclinical screening of drugs using experimental methods.
- **CO-3** Identify appropriate experimental models for evaluating drugs acting on various systems.
- **CO-4** Summarize research methodology and apply biostatistical methods in experimental studies

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean-Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

4. Course Contents

Unit 1: Laboratory Animals

Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.

10 hours

Unit 2: Preclinical screening models

Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study.

Study of screening animal models for Diuretics, nootropics, antiasthmatics. Preclinical screening models for CNS activity- analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, anti-Parkinson's, anti -Alzheimer's

15 Hours

Unit 3: Preclinical screening models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics **7 hours**

Unit 4: Preclinical screening models: for CVS activity- anti-hypertensives, anti-arrhythmic, antidyslipidemic, anti -aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like anti-ulcer, anti-diabetic and anti-cancer.

8 Hours

Unit 5: Research methodology and Bio-statistics: Selection of research topic, review of literature, research hypothesis and study design pre-clinical data analysis and interpretation using Students't' test and One-way ANOVA. Graphical representation of data

5 Hours

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	3						3					3	
CO-2			3									3	
CO-3			3	3					3		2	3	
CO-4			3								3		3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		5
1. Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Written examination		5
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B. Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document. The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1 hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination.

Component - 2: 75 marks

A 3 hour duration Semester End Examination will be conducted for maximum marks of 75 and both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester. Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Course Laboratory/work
2.	Understanding	Course Laboratory/work
3.	Critical Skills	Course Laboratory/work
4.	Analytical Skills	Course Laboratory/work
5.	Problem Solving Skills	Course Laboratory/work
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Essential Reading

1. Ghosh, M.N. (2008) Fundamentals of Experimental Pharmacology. 6th edn. Kolkata: Hilton and Company.
2. Kulkarni, S. K. (2010) Handbook of experimental pharmacology.3rd edn. Delhi: Vallabh Prakashan.
3. CPCSEA, (2003) CPCSEA guidelines for laboratory animal facility. Indian J Pharmacol, 35, pp. 257-274
4. Vogel, H.G. (2002) Drug discovery and evaluation. 2nd edn. New York: Springer.

b. Recommended Reading

1. Gupta, S.K. (2005) Drug Screening Methods. New Delhi: Jaypee Brothers Medical Publishers.
2. Sundar Rao, P.S.S., Richard, J. (2012) Introduction to Biostatistics and Research Methods. New Delhi: PHI learning Pvt. Ltd.

c. Magazines and Journals

1. Indian Journal of Pharmacology.
2. Journal of Pharmacology and Experimental Therapeutics.
3. European journal of Pharmacology.
4. British Journal of Pharmacology.

d. Websites

1. www.aspet.org
2. www.virtualpharmacologylab.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Advanced Instrumentation Techniques (Theory)

Course Title	Advanced Instrumentation Techniques Theory
Course Code	BPE474
Course Type	Elective
Department	Pharmaceutical Chemistry
Faculty	Pharmacy

1. Course Summary

The aim of this course is to create awareness among students on advanced instruments and their utility in pharmaceutical sciences. This course deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. The course is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques.

2. Course Size and Credits:

Number of credits	4
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of weeks in a semester	15
Department responsible	Pharmaceutical Chemistry
Total Course marks	**100** **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Explain the principles of advanced instrumental analysis such as NMR, thermal methods of analysis and hyphenated techniques
CO-2 Discuss the principles and applications of Radio immunoassay and X –ray diffraction methods
CO-3 Elaborate the stepwise calibration of specified analytical Instruments
CO-4 Outline the extraction techniques used in Pharmaceutical Analysis

4. Course Contents:

Unit 1 (Nuclear Magnetic Resonance & Mass Spectroscopy):
Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications **10 hours**

Unit 2 (Thermal Methods of Analysis):
Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X- ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications **08 hours**

Unit 3 (Calibration and validation-as per ICH and USFDA guidelines)
Calibration of following Instruments- Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC **07 hours**

Unit 4 (Radio immune assay and Extraction techniques)
Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction **10 hours**

Unit 5 (Hyphenated techniques)
LC-MS/MS, GC-MS/MS, HPTLC-MS **10 hours**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54

Dean / Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1				3							3		3
CO-2				3							3		3
CO-3				3							3		3
CO-4				2							2		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in	Total Duration in
Face to Face Lectures		40
Demonstrations		3
1. Demonstration using Videos		
2. Demonstration using Physical Models/Systems	1	
3. Demonstration on a Computer	2	
Tutorials		15
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		2
1. Case Study Presentation	1	
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions	1	
5. Group Discussions		
6. Discussing Possible Innovations		
Written Examination		5
Total Duration in Hours		65

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			Component 2: SEE (75% Weightage)
Subcomponent	SC1	SC2	SC3	
Subcomponent Type	Attendance	Assignment and Student Interaction	Sessional Exam	Semester End Examination 75 Marks
Maximum Marks	4	6	15	
CO-1			X	X
CO-2			X	X
CO-3			X	X
CO-4			X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction.

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted,one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Component - 2: 75 marks
A 3-hour duration Semester End Examination will be conducted for maximum marks of 75. Both components will be moderated by a second examiner.

Re-assessment
1. A student who fails to secure a minimum 50% in component-1 and 2 put together will beasked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have toappear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulationsgoverning this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teachingand learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments
2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class notes

b. Essential Reading

1. Willard, Merritt, Dean, Settle. Instrumental methods of analysis CBS publishers NewDelhi
2. Beckett A H and Stenlake J B Practical Pharmaceutical chemistry Vol I and II CBSpublishers New Delhi
3. *D.* A. Skoog and *J. J.* Leary. Principles of Instrumental Analysis.. Saunders CollegePublishing, Philadelphia

c. Recommended Reading

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

1. F A Settle. Hand book of Instrumental techniques for Analytical chemistry Prentice Hall
2. L.G. Chatten Pharmaceutical chemistry Marcel Dekker NY
3. K.A. Connors A text book of pharmaceutical analysis John Willey
4. J.W. Munson Pharmaceutical analysis- modern methods Taylor & Francis NY
5. J. Mendham, R.C. Denny. G.H. Jeffery, J. Bassett,. Vogel's text book of quantitative chemical analysis Pearson Education Ltd., UK

d. Magazines and Journals

1. Indian journal of Pharmaceutical Sciences, IPA, Mumbai, India
2. Journal of Pharmaceutical Analysis, Elsevier, Amsterdam, Netherlands
3. International Journal of chemical and Pharmaceutical Sciences, Pharma research library, India

e. Websites

1. http:// www.ich.org/
2. https://www.analytic-news.com/

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Course Specifications: Dietary Supplements and Nutraceuticals Theory

Course Title	Dietary Supplements and Nutraceuticals Theory
Course Code	BPE475
Course Type	Core Elective
Department	Pharmacognosy
Faculty	Pharmacy

1. Course Summary

This course aims to impart the basic knowledge for understanding the need and requirements of dietary supplements and nutraceuticals among different populations. It also emphasizes on regulatory requirements on food safety and adulteration of foods.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	70
Number of Weeks in a Semester	15
Department Responsible	Pharmacognosy
Total Course Marks	100 **Component 1(IA): 25 Marks** 1A: Attendance: 4 Marks 1B: Assignment and interaction with student: 6 Marks 1C: Sessional Exam: 15 Marks **Component 2 (SEE):** Semester End Examination: 75 Marks
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

- **CO-1** Explain nutraceuticals, functional foods, classification, and role in health care
- **CO-2** Discuss the role of phytochemicals as nutraceuticals
- **CO-3** Elaborate free radicals, antioxidants, and their role in chronic diseases
- **CO-4** Appraise processing effects, regulations, and quality standards of nutraceuticals.

4. Course Contents

Unit 1:

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.

b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.

c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng,

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Garlic, Broccoli, Gingko, Flax seeds **7 hours**

Unit 2:

Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following

a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin
b) Sulfides: Diallyl sulfides, Allyl trisulfide.
c) Polyphenolics: Reservetrol
d) Flavonoids- Rutin, Naringin, Quercitin, Anthocyanidins, catechins, Flavones
e) Prebiotics / Probiotics: Fructo oligosaccharides, Lacto bacillum
f) Phytoestrogens: Isoflavones, daidzein, Geebustin, lignans
g) Tocopherols
h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like. **15 hours**

Unit 3:

a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.
b) Dietary fibres and complex carbohydrates as functional food ingredients. **7 hours**

Unit 4:

a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals Involvement in other disorders. Free radicals theory of ageing.
b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione, Vitamin C, Vitamin E, α-Lipoic acid, melatonin; Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.
c) Functional foods for chronic disease prevention **10 hours**

Unit 5:

a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.
b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK, HACCP and GMPs on Food Safety. Adulteration of foods.
c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals. **6 hours**

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1	1											1	
CO-2	2											1	
CO-3						3						1	
CO-4											2		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1.Demonstration using Videos	5	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Tutorials		15
Practical Work		
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Written Examination		05
Total Duration in Hours		**65**

7. Course Assessment and Reassessment

The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the B.Pharm Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component(CE or SEE) or subcomponent of CE (SC1, SC2 or SC3), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (25% Weightage)			**Component 2: SEE (75% Weightage)**
Subcomponent	**SC1**	**SC2**	**SC3**	
Subcomponent Type	**Attendance**	**Assignment and Student Interaction**	**Sessional Exam**	**Semester End Examination 75 Marks**

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Maximum Marks	4	6	15	
CO-1			X	X
CO-2		X	X	X
CO-3		X	X	X
CO-4		X	X	X
The details of SC1, SC2, SC3 are presented in the Programme Specifications Document.				

Component - 1: 25 marks

1A. Guidelines for the allotment of marks for attendance

Percentage of Attendance Theory	Marks
95 – 100	4
90 – 94	3
85 – 89	2
80 – 84	1
Less than 80	0

1B. Assignment and interaction with student: Assignment and interaction with student: Student is required to submit 1 assignment which is set for 12 marks at the end of 14th week and the marks scored will be reduced to 3 marks and 3 marks for staff student interaction

1C. Sessional exam: Two sessional exams (each for 30 marks) of 1-hour duration will be conducted, one at the end of 6th week and the other at the end of the 12th week. The average of the 2 sessional marks reduced to 15 will be the marks scored in the Sessional Examination

Component - 2: 75 marks

A 3-hour duration Semester End Examination will be conducted for maximum marks of 75.
Both components will be evaluated by concerned course leader/s.

Re-assessment

1. A student who fails to secure a minimum 50% in component-1 and 2 put together will be asked to register for Supplementary examination.
2. A student who has not satisfied the attendance requirement (not eligible for SEE) shall have to appear for Supplementary examination.
3. The maximum number of such opportunities are limited and as per the academic regulations governing this Programme.

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures, Assignments

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

2.	Understanding	Classroom lectures, Assignments
3.	Critical Skills	Classroom lectures, Assignments
4.	Analytical Skills	Classroom lectures, Assignments
5.	Problem Solving Skills	Classroom lectures, Assignments
6.	Practical Skills	--
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	Assignment, Examination
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, Examination
14.	Personal Management	Course work
15.	Leadership Skills	Course work

9. Course Resources

a. Class Notes

b. Essential Reading

1. Sri Lakshmi, (2014) Dietetics. 7th ed, New Delhi: New Age International Pvt Ltd.
2. Agusti, K.T and Faizal P. (2009) Role of dietary fibres and neutraceuticals in preventing diseases. Hyderabad: BS Publication.
3. Cooper, K.A. (1996) Advanced Nutritional Therapie. UK: Thomas Nelson.
4. Jean Carper. (1988) The Food Pharmacy.UK: Simon & Schuster, UK Ltd.
5. James F.Balch., Balch A. (1997) Prescription for Nutritional Healing. 2nd ed. New York: Avery Publishing Group.
6. Gibson G., Williams C. (2000) Functional foods. London: Wood head Publications Company.
7. Goldberg, I. (1994) Functional Foods. New York: Chapman and Hall.
8. Sachmidl, M.K., Labuza, T.P. (2000) Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in Essentials of Functional Foods. AspenPress.
9. Robert, E.C. Wildman, Robert Wildman. (2006) Handbook of Nutraceuticals and Functional Foods. 3rd ed. (Modern Nutrition)
10. Shils, M.E., Olson, J.A., Shike, M. (1994) Modern Nutrition in Health and Disease. 8th ed. Lea and Febiger.

c. Recommended Reading

1. Rangari, V.D, (2003) Pharmacognosy and Phytochemistry. 1st ed. Nashik: Career Publications.
2. Kokat,e C.K., Purohit A.P., and Gokhlae S.B. (2010) Pharmacognosy. 45th ed, Pune: NiraliPrakashan.

d. Magazines and Journals

1. Pharmacognosy Magazine – Ph.cog.net, Bangalore.
2. Journal of Natural products - Informatics Publishing Limited, New Delhi
3. Indian Journal of Natural Products and Resources – NISCAIR, New Delhi

e. Websites

1. www.phcognet.com
2. Herbnet.com

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Course Specifications: Project Work

Course Title	Project Work
Course Code	BPP476
Departments	Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry, Pharmacology and Pharmacy Practice
Faculty	Pharmacy

1. Course Summary

This course is intended to apply and synergize the learning outcomes of B. Pharm, in Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry and Pharmacology through a group project. The project work will focus on the application of appropriate methods and techniques for the development of various dosage forms both theoretically and practically. This course will enable students to gain practical experience of working in a project mode, having interactions with the domain specialist to meet the technical challenges of the project undertaken.

2. Course Size and Credits:

Number of Credits	06
Credit Structure (Lecture: Tutorial: Practical)	0:0:12
Total number of hours	180
Number of Semester Weeks	15
Departments Responsible	Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry, Pharmacology and Pharmacy Practice
Course Marks	**Total Mark: 150** **Component I:** Presentation, Viva-voce, Demonstration- 75 Marks **Component II:** Project Report- 75 Marks
Pass Requirement	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

CO-1 Formulate project objectives by analyzing relevant literature, resources available and timelines

CO-2 Design and implement suitable methodologies using modern tools to collect, analyze, and evaluate experimental data

CO-3 Demonstrate leadership and teamwork by organizing and managing project activities, and communicate outcomes through technical presentations and comprehensive reports

4. Course Contents

- Need for undertaking the project
- Objectives of the project
- Collection of relevant literature and review of literature
- Writing down the specifications

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

- Product development planning, cost calculations
- Developing a product/method
- Choosing suitable methodologies, learning the appropriate instruments and techniques
- Collection of data, Data Analysis, interpretations, testing and evaluation
- Time management, team approach, leadership skills
- Demonstration to the defined audience and making a presentation to the assessing team
- Making a Technical presentation
- Writing project report

5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2
CO-1		3										3	
CO-2			3	3								3	
CO-3					3						2	3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Literature collection, Review of literature, Problem formulation and Defining specifications ,Deciding the sample for data collection	30	
Development of design concept, Basic design calculations	30	
Selection of instruments, techniques and learning on how to use them	30	
Methodology, Modelling, Simulation, Data collection, Analysis of data	50	
Evaluation, Verification of results	10	
Demonstration, Presentation and Report Writing	30	
Total Duration in Hours	180	

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore-54

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

7. Method of Assessment

There are two components for assessment in this course:

Focus of COs on each Component or Subcomponent of Evaluation		
	Component 1: CE (50% Weightage)	**Component 2: SEE (50% Weightage)**
Maximum Marks	**75**	**75**
CO-1	**X**	**X**
CO-2	**X**	**X**
CO-3	**X**	**X**
CO-4	**X**	**X**
The details of SC1, SC2 are presented in the Programme Specifications Document.		

There are two components for assessment in this course:

Component - 1: 75 Marks (CE/IA)

Evaluation of Dissertation Book:

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks
Total	**75 Marks**

Component - 2: 75 Marks (SEE)

Evaluation of Presentation:

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks
Total	**75 Marks**

5. Re-assessment

1. A student not registered for this course in the first attempt with a team may have to carry out the project in a team if available or individually during the supplementary examination or the next year with the new batch of students
2. If the team fails, the team need to makeup during the supplementary examination.

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

8. Achieving COs

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Project Work
2.	Understanding	Project Work
3.	Critical Skills	Project Work
4.	Analytical Skills	Project Work
5.	Problem Solving Skills	Project Work
6.	Practical Skills	Project Work
7.	Group Work	Project Work
8.	Self-Learning	Project Work
9.	Written Communication Skills	Technical report
10.	Verbal Communication Skills	Project Presentation, Interaction during project work
11.	Presentation Skills	Project Presentation
12.	Behavioral Skills	Project Work
13.	Information Management	Project Work
14.	Personal Management	Project Work
15.	Leadership Skills	Project Work

9. Course Resources

a. Essential Reading

1. Presentations made by the Head of the Department on "Importance of Project work and the Methodology to be followed for successful Completion of Project work"

b. Recommended Reading

1. Course Notes, Manuals

Dean
Faculty of Pharmacy
M.S. Ramaiah University of Applied Sciences
Bangalore - 54.

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore-560054