RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Programme Structure and Course Details of B.Sc. (Hons)-Cardiac Care Technology 2024-2028

Programme Code: 406

Faculty of Life and Allied Health Sciences
Department of Allied Health Sciences

Head
Department of Allied Health Sciences
M S Ramaiah University of Applied Sciences
Bangalore 560054

Dean- Academics
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Approved by the Academic Council at its 32th meeting held on 22nd June 2024

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 the society 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

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enrich the experiences of faculties and students through research and developmental programmes

Programme Specifications: B.Sc. (Hons) - Cardiac Care Technology

Faculty	Life and Allied Health Sciences
Programme Code	406
Programme Name	B.Sc. (Hons) - Cardiac Care Technology
Dean of the Faculty	Dr Soma Chaki
Head of the Department	Dr. Tushar Shaw

1. **Title of the Award**

   B.Sc. (Hons) – Cardiac Care Technology

2. **Mode of Study**

   Full Time

3. **Awarding Institution /Body**

   M. S. Ramaiah University of Applied Sciences

4. **Joint Award:**

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5. **Teaching Institution**

   Faculty of Life and Allied Health Sciences

   M. S.Ramaiah University of Applied Sciences, Bengaluru (India)

6. **Date of Programme Specifications**

   July 2022

7. **Date of Programme Approval by the Academic Council of MSRUAS**

   14-07-2022

8. **Next Review Date**

   June 2026

9. **Programme Approving Regulating Body and Date of Approval**

   Academic Council of MSRUAS on 14-07-2022

10. **Programme Accredited Body and Date of Accreditation**

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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

B.Sc. (Hons) in Cardiac Care Technology is an undergraduate degree Programme designed to create innovative problem solvers with a multi-disciplinary approach, entrepreneurs and leaders that apply their knowledge, understanding, cognitive abilities, practical skills and transferable skills gained through systematic, flexible and rigorous learning in the chosen academic domain towards betterment of society.

With the current trends of National Education Policy (NEP) – 2020 and Self-Employment, there is a tremendous need for a young workforce with skillset that will make the students readily employable, for various roles in academia and industry. The objective is to bridge the gap between the current system of education and what is required in the 21st century. It is to have Holistic and Multidisciplinary UG Education toproduce employable graduates with well-rounded personality. The Government of Karnataka had constituted a Task to suggest an Implementation Framework for NEP-2020. It had also constituted two sub- committees, one on Curriculum Reforms in Higher Education and the other on Governance and Regulations.

B.Sc. (Hons) in Cardiac Care Technology is an undergraduate degree programme is driven by several compelling rationales, primarily aimed at improving the diagnosis, treatment, and overall management of cardiovascular diseases. Cardiac technologists work alongside physicians to diagnose and treat cardiac (heart) and peripheral vascular (blood vessel) disorders. They play an important role in the management of many cardiac illnesses that need extensive diagnostic and therapeutic methods.

The Task Force has suggested NEP-2020 Implementation Framework for Karnataka. The State Government has accepted the action plan and initiated steps to implement NEP-2020, as per the Roadmap suggested by the Task Force. The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this Programme, students develop critical, analytical thinking and problem-solving abilities for a smooth transition from academic to real-life work environment. Special emphasis shall also be provided to Ability and Skill Enhancement/Vocational

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Courses as well as Value Added Courses. Students complete a one-year internship at hospitals to gain hands-on experience and to work as part of a team to improve practical skills and problem-solving ability. The students are required to submit a well written project report as partial fulfilment for the award of the degree, which will help develop skills of documenting scientific research methods and outcome. This Undergraduate Programme is meant to highlight systemic change in the higher education system in MSRUAS and align itself with the National Education Policy - 2020.

15. Programme Mission

The purpose of the programme is to create innovative problem solvers with a multi-disciplinary approach, entrepreneurs and leaders that apply their knowledge, understanding, cognitive abilities, practical skills and transferable skills gained through systematic, flexible and rigorous learning in the chosen academic domain towards betterment of society.

16. Graduate Attributes

GA-1.Ability to apply fundamental knowledge of Biology, Chemistry, Mathematics, Statistics andcomputer to solve real life problems in their chosen domain

GA-2.Ability to perform administrative duties in government, semi-government, private and publicsector organizations

GA-3. Ability to teach in schools, colleges and universities with additional qualification and training

GA-4. Ability to understand and solve scientific problems by conducting experimental investigations

GA-5. Ability to apply appropriate tools, techniques and understand utilization of resources

appropriately in various Laboratories

GA-6. Ability to apply basic programming concepts in their chosen domains

GA-7. Ability to understand the effect of scientific solutions on legal, cultural, social and public healthand safety aspects

GA-8. Ability to develop sustainable solutions and understand their effect on society and environmentGA-9. Ability to apply ethical principles to scientific practices and professional responsibilities

GA-10. Ability to work in a team, to plan and to integrate knowledge of various disciplines and to leadteams in multidisciplinary settings

GA-11. Ability to effectively convey scientific ideas and concepts to a broad audience using both writtenand verbal means

GA-12. Ability to adapt to the changes and advancements in science and engage in independent and life-long learning.

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17. Programme Outcomes (POs) / Programme objectives:

B.Sc. (Hons) Cardiac Care Technology graduates will be able to:

At the completion of this course, the student should be able to perform medical evaluations and examinations, analyse data and use patient monitoring equipment. Curriculum also covers patient consultation conduct, ultrasounds, diagnostic and therapy treatment procedures, running an averageof three years, program culminate to a hospital internship.

PO 1- Clinical care: Acquire and apply knowledge of basic sciences to cardiovascular system.

PO 2- Communication: Acquire effective verbal and written communication skills with the cardiac teammembers and patients.

PO 3- Membership of a multidisciplinary heath team: Discuss various case studies related to invasive & non –invasive cardiac care procedures & demonstrate the basic techniques in cardiac care.

PO 4- Ethics and accountability at all levels: Understand and commit to high standards of ethics in line with the code of conduct of medical practice. Adopt various quality assurance and patient safety measures while workingin community or hospitals.

PO 5- Commitment to professional excellence: Identify, analyse and critically evaluate problems related to cardiacdiseases and provide effective solutions and quality care.

PO 6- Leadership and mentorship: Play active role in spear heading projects relating to prevention and diagnosisof cardiac diseases.

PO 7- Social accountability and responsibility: Take responsibility for maintaining the highest quality of healthcare professionalism and effective interaction with patients community and health care workers.

PO 8- Lifelong learning: Recognise the need for updating knowledge and upgrading technical skills to meet the current professional development. Self-motivate and enhance entrepreneurship skills for career development in technology for cardiac health care services.

18. Programme Goal

The Programme acts as a foundation degree and helps to develop critical, analytical and problem solving skills at first level. The foundation degree makes the graduates employable in health care organizations and also to assume administrative positions in various types of organizations. With additional qualifications and training help the graduates to pursue a career in academics or scientificorganizations as a researcher.

The goals of the Programme include:

- Promote holistic development
- Ability to choose learning trajectories and programmes
- Eliminate harmful hierarchies among disciplines/fields of study and silos between different areasof learning
- Multidisciplinary and holistic education to ensure unity and integrity of knowledge
- Promote creativity and critical thinking to encourage logical decision-making along withappreciating ethical, human & constitutional values
- Promote multilingualism and power of language in learning and teaching
- Impart life skills such as communication, cooperation, teamwork, and resilience
- Facilitate outstanding research as a co-requisite for outstanding education and development

19. Programme Educational Objectives (PEOs)

B.Sc. (Hons) in Cardiac Care Technology is an undergraduate degree programme is driven by several compelling rationales, primarily aimed at improving the diagnosis, treatment, and overall management of cardiovascular diseases. Cardiac technologists work alongside physicians to diagnose and treat cardiac (heart) and peripheral vascular (blood vessel) disorders. They play an important role in the management of many cardiac illnesses that need extensive diagnostic and therapeutic methods.

The objectives of the programme are to enable the students to:

PEO -1: Provide students with a strong foundation in Cardiac Care, to enable them to knowledgeable andtechnically competent cardiac technologist to meet the needs of patient care in cardiac centers & multidisciplinary hospitals.
PEO -2: Impart technical skills required to develop innovative solutions as per industry and societal requirementsin cardiac care
PEO-3: Impart the required managerial and entrepreneurial skills to enable students to work in multidisciplinarycardiac teams and to contribute to the cardiac care needs of the society.
PEO -4: Instill human values, social, interpersonal and leadership skills required for professional success inevolving as global professionals.

20. Programme Specific Outcomes (PSOs)

At the end of the **B.Sc. (Hons) Cardiac Care Technology** Programme the graduate will be able to:

PSO-1: Apply knowledge and skills of cardiac care to provide safe and effective care to the patients for achievingprofessional excellence.
PSO-2: Adapt to the technological advancement in cardiac care by upgrading to the

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latest practices in the field ofcardiac care technology.

PSO-3: Demonstrate the leadership qualities and strive for the betterment of organization, environment andsociety.

PSO-4: Demonstrate an understanding of the importance of lifelong learning through professional development,practical training and specialized certifications.

21. Program Structure

Course code	Course	T (H/W/S)	Tut (H/W/S)	P (H/W/S)	Total credits	Marks
Semester 1						
AHD101A	General Anatomy	2	0	2	3	100
AHD102A	General Physiology	2	0	2	3	100
AHD103A	HCDS	2	0	0	2	50
AHD104A	General Microbiology	2	0	2	3	100
AHD106A	Basic Electrical and Electronics	2	0	2	3	100
AHD105A	Applied Physics	2	0	2	3	100
	Language – 1 (1)	3	0	0	3	100
	TOTAL	15	0	10	20	650
	Total number of contact hoursper week	**25Hrs**				
Semester 2		**T (H/W/S)**	**Tut (H/W/S)**	**P (H/W/S)**	**Total credits**	**Marks**
AHD107A	General Biochemistry	2	0	0	2	50
AHD108A	General Pharmacology	2	0	0	2	50
AHD109A	Concepts of Hospital infectionprevention	2	0	0	2	50
AHD110A	General Pathology	2	0	2	3	100
AHD111A	Environmental Science and Health	2	0	0	2	50
AHD112A	Early Clinical Education	0	0	24	12	100
	TOTAL	10	0	26	23	400
	Total number of contact hoursper week	**36 Hrs**				
Semester 3		**T (H/W/S)**	**Tut (H/W/S)**	**P (H/W/S)**	**Total credits**	**Marks**
CCC201A	Basic concepts of cardiac CareTechnology	2	2	2	4	100
CCC202A	Clinical cardiology	2	2	2	4	100
	Open Electives -1	2	0	0	2	50
AHN202A	Language – 2 (3)	3	0	0	3	100
CCC203A	Studentship (Directed ClinicalEducation) 1	0	0	18	9	100

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	TOTAL	09	4	22	22	450
	Total number of contact hoursper week	35 Hrs				
Semester 4		**T (H/W/S)**	**Tut (H/W/S)**	**P (H/W/S)**	**Total credits**	**Marks**
CCC204A	Cardiac Evaluation & therapies –I	2	2	2	4	100
CCC205A	Applied cardiac care technology -I	2	2	2	4	100
	Open Electives -2	2	0	0	2	50
AHN203A	Constitution of India	2	0	0	2	50
AHN204A	SEC-3: Professional communication	1	0	2	2	50
CCC206	Studentship (Directed ClinicalEducation) 2	0	0	24	12	100
		9	4	30	26	450
	Total number of contact hoursper week	**43 Hrs**				
Semester 5		**T (H/W/S)**	**Tut (H/W/S)**	**P (H/W/S)**	**Total credits**	**Marks**
CCC301A	Cardiac Evaluation & therapies –II	2	2	2	4	100
CCC302A	Applied cardiac care technology –II	2	2	2	4	100
AHN305A	Project Management	2	0	2	2	50
CCC303A	Studentship (Directed ClinicalEducation) 3	0	0	24	12	100
	TOTAL	8	4	30	22	350
	Total number of contact hoursper week	**42 HRS**				
Semester 6		**T (H/W/S)**	**Tut (H/W/S)**	**P (H/W/S)**	**Total credits**	**Marks**
CCC304A	Nuclear cardiology	2	2	2	4	100
CCC305A	Advanced cardiac care technology	2	2	2	4	100
AHC308A	Research methodology and Biostatistics	3	0	0	3	100
AHN308A	Personality Development and Soft Skill	1	0	2	2	50
CCC307A	Studentship (Directed Clinical Education 4)	0	0	24	12	100
	TOTAL	8	4	31	25	450
	Total number of contact hours per week	**43 Hrs**				
Semester 7		**T (H/W/S**	**Tut (H/W/S**	**P (H/W/S)**	**Total credit**	**Marks**

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CCP401A	Research Project	0	0	20	10	100
CCI401A	Internship	0	0	22	11	100
		0	0	42	21	200
	Total number of contact hoursper week	**42Hrs**				
Semester 8		**T (H/W/S)**	**Tut (H/W/S)**	**P (H/W/S)**	**Total credits**	**Mark s**
CCP402A	Research Project	0	0	20	10	100
CCIA402A	Internship	0	0	22	11	100
		0	0	42	21	200
	Total number of contact hoursper week	42Hrs				
Maximum Marks		**3150 (650+400+450+450+350+450+200+200)**				
Total Credits		**180(20+23+22+26+22+25+21+21)**				

Note: The Vacations and other activities shall be as per the Timetable for the corresponding batch.

***Open Elective Courses*:** Several open elective courses from the Faculty of Mathematical and Physical Sciences, Engineering, Management and Commerce, Art and Design, Hospitality Management and Catering Technology, Pharmacy, and Dental Sciences will be announced one semester before the scheduled semester. The students can also register through online mode via digital platforms such as NPTEL, Swayam, Coursera etc., as per the regulations.

22. Programme Delivery

As per the Time Table.

23. Teaching and Learning Methods

The module delivery comprises a combination of a few or all the following:

1. Face-to-face lectures using audio-visuals.
2. Workshops-group discussions, debates, presentations
3. Demonstrations
4. Guest lectures
5. Laboratory-work/Fieldwork/Workshop
6. Hospital postings

7. Seminars
8. Group Exercises
9. Project Work

24. Learning methodologies

With a focus on self-directed learning, the curriculum will include a foundation course that focuses on communication, basic computer skills, professionalism, ethics and law. It also incorporates earlyclinical exposure and directed clinical education during specialty training. It is envisaged that the AHPs should have sufficient clinical exposure integrated with the learning of basic and laboratory sciences. There is an emphasis on the introduction of case scenarios for classroom discussion/case-based learning.

It is well documented in the literature that teaching and learning of clinical skills occur at the patient's bedside or other clinical areas supplemented by didactic teaching in classrooms and lecturetheatres. Our institute has instituted clinical skill centers, laboratories and high-fidelity simulation laboratories to enhance the practice and training for allied and healthcare students and professionals. The skills training center overcomes the shortcoming of patients being used to learn and practice the necessary skills. The use of simulators addresses many issues such as lack of confidence and inadequate skills in handling the equipment. Practice on simulators and withcorrective measures students can hone the skills and gain confidence to perform in real life situations.

Teaching and Learning Methods

1. Team teaching/ Integrated teaching
2. Face to Face lectures using audio-visuals.
3. Seminars/journal clubs/e-lectures
4. Case based discussions.
5. Group discussions, debates, presentations
6. Demonstrations on videos, computers, and models
7. Hospital based learning.
8. Laboratory work
9. Dissertation/ Group project work

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10. School visits/Outreach centre visits
11. Interdepartmental meets
12. Continuing medical education programs/symposiums/workshops state/national/international conferences and conventions

26. Assessment and Grading

26.1 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 and experiential assessment. The assessment of the subcomponents of Œis 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.

Marks obtained CE and SEE components have 60:40 weightage (CE: 60% and SEE: 40%) in determining the final marks obtained by a student in a Course.

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

26.2 Continuous Evaluation Policies

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

26.2 Theory Courses

The following is the CE components:

CE (60% weightage)			SEE (40% weightage)
SC1 (Term Tests) 30%	SC2 (Innovative assignment) 10%	SC3 (Written assignment) 20%	SEE (Theory)

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the followingtypes:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio

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f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission
l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

26.2.1 **Theory + Laboratory Courses**

The following is the CE components:

CE (60% weightage)			**SEE (40% weightage)**	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent isevaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission

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l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

27. Attendance

A minimum of 80 % attendance is compulsory to appear for semester end examinations.

28. Award of degree

As per the Academic Regulations for B.Sc. (Hons) MRIT Programme

29. Student Support for Learning

Student are given the following support:

a. Reference Books in the Library
b. Pre-reads and handouts
c. Cases/ Case Study and Case lets
d. Magazines and Journals
e. Internet Facility
f. Computing Facility
g. Laboratory Facility
h. Workshop Facility
i. Staff Support
j. Lounges for Discussions
k. Any other support that enhances their learning

30. Quality Control Measures

The following are the Quality Control Measures:

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1. Review of question papers and assignment at the Department Level
2. Student feedback
3. Opportunities for the students to see their assessed work.
4. Review by External Examiners and External Examiners Reports
5. Staff Student Consultative Committee Meetings
6. Student Exit Feedback
7. Subject Assessment Board
8. Programme Assessment Board

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

32. 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.

33. 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.

34. 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

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Sem	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
1	General Anatomy	3	1	2			1					3	3
1	General Physiology	2		1	1	1				2			
1	Health Care Delivery Systems of India	1	1	1	2	1		2	1	2			1
1	General Microbiology		2	1		2	2	2	1	2		1	1
1	Basic Electrical and Electronics												
1	Applied Physics												
1	Language-1	2	2	1	2	2			1	2			1
2	General Biochemistry	3	1	1		2				3			
2	General Pharmacology	2			2	2			1	3			1
2	Concepts of Hospital infection prevention	1	1	2	2	2	1	2	1	2		1	1
2	General Pathology	2		1	1	2			1	2		1	
2	Environmental studies and Health												
2	Early Clinical Education	3	1	1		3	1		1	3		1	
3	Basic concepts of cardiac Care Technology	3				1				2			
3	Clinical cardiology	3				2				1			
3	Open Electives -1												
3	Language – 2 (3)												
3	Studentship (Directed Clinical Education) 1					3	1					2	
4	Cardiac Evaluation & therapies –I	3				2				1			
4	Applied cardiac care technology -I	3				1				2			
4	Open Electives -2												
4	Constitution of India												
4	Professional communication												
4	Directed Clinical Education -2					3	1					2	
5	Cardiac Evaluation & therapies –II	3				2				1			
5	Applied cardiac care technology – II	3				1				2			
5	Project Management												
5	Studentship (Directed Clinical Education) 3					3	1					2	
6	Nuclear Cardiology	3				1				2			
6	Advanced cardiac care technology	3				2				2			
6	Research Methodology												
6	Personality Development and Soft Skill												

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6	Studentship (Directed Clinical Education) 4					3	1					2	
7	Research Project												
7	Internship												
8	Research Project												
8	Internship												

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Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2026

RAMAIAH UNIVERSITY OF APPLIED SCIENCES

B.Sc. (Hons) – Cardiac Care Technology 2022-2026

SEMESTER 1

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Course Title	General Anatomy
Course Code	AHD 101A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

1. Course Summary

1. Aim and Summary

The course aims to impart basic knowledge of general human anatomy which forms the basis for understanding other related subjects such as physiology, pathology and surgery. Emphasis will be placed on cell structure and functions. The various basic tissues of the body, their structure and functional co-relation will be taught. Formation of gametes and early development of the human fetus will be dealt with in short. Various organ systems, their components and basic functions will be covered under this course.

2. Course Size and Credits:

Number of Credits	3
Total Hours of Classroom Interaction	30
Number of laboratory Hours	15
Number of Semester Weeks	16
Department Responsible	Allied Health Sciences
Course Marks	100
Pass Requirement	As per university regulations
Attendance Requirement	As per university regulations

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Teaching, Learning and Assessment

3. Course Outcomes (CO)

No.	Course outcome
1.	Describe the structure and functional organization of a basic human cell andthe normal anatomical positions and planes of the body
2.	Explain the structure and functions of basic tissues
3.	Explain the components of the organ systems and its basic functions
4.	Identify the parts of a compound microscope and differentiate microscopyof basic tissues
5.	Demonstrate the parts and position of bones in the human body and early development of fetus.
6.	Demonstrate the surface anatomy of structures and interpret data obtained fromvarious imaging techniques.

4. Course Contents:

Unit 1: Introduction: Introduction to the human body as a whole, Anatomical terms, planes and positions, The cell: Structure, function and multiplication

Unit 2: Tissues: Types, structure, characteristics, functions, Simple and Compound Epithelium, Connective tissue, Cells, fibers and types, Cartilage, Blood vessels, Muscle, Bone, Nervous tissue, Skin and SalivaryGlands

Unit 3 Embryology: Fertilization and General embryology

Unit 4 Osteology: Axial skeleton (Skull : Cranium, air sinuses, Vertebral column: regions, movements and characteristics, Sternum, Ribs)Appendicular skeleton (Bonesinvolving Shoulder girdle and Upper limb, Pelvic girdle and lower limb, healing of bones: cellular activity, Factors that delay healing, Diseases of
bones and joints), Development of bone and stages of ossification

Unit 5 Organ systems: Musculoskeletal system, Digestive system, Respiratory system, Circulatory system, Excretory system, Nervous system, Integumentary system, Endocrine system, Lymphoid system

Unit 6

Practical:

- Histology of epithelium
- Histology of Connective tissue
- Histology of cartilage
- Histology of bone
- Histology of muscle

- Histology of nervous tissue
- Histology of blood vessels
- Histology of skin
- Histology of Salivary glands
- Demonstration of embryology models
- Demonstration of bones Surface anatomy of all organ system
  Interpretation of Radio images

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					PSO -1	PSO -2	PSO -3	PSO -4
CO -1		1	2			1										
CO -2		1	2			1										
CO -3	3	1	2			1									3	3
CO -4		1	2			1										
CO -5		1	2			1										
CO -6	3	1	2			1									3	3

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

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5. Course Teaching and Learning Methods:

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		14
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	15	15
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation	05	
2. Guest Lecture		
3. Industry/Field Visit		16
4. Brain Storming Sessions		
5. Group Discussions	10	
6. Discussing Possible Innovations	01	
Written Examination (Mid-Term tests and SEE)		10
Total Duration in Hours		55

6. Method of Assessment

The components and subcomponents of course assessment are presented in the Academic Regulations document pertaining to the Programme. The procedure to determine the final course marks is also presented in the Academic Regulations document as well. The assessment questions are set to test the course learning outcomes. In each component or subcomponent, certain Course Outcomes are assessed as illustrated in the following Table.

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

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7. Achieving Course Learning Outcomes

The following skills are directly or indirectly imparted to the students in the followingteaching 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, Examination
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	--

8. Course Resources

1. Essential Reading

1. BD Chaurasia; 2015; **Handbook of General Anatomy,** 5th Edition; CBS Publishing.
2. IB Singh; 2016; **Textbook of Human Histology,** 8th Edition; Jaypee Brothers MedicalPublishers.
3. IB Singh; 2017; **Human Embryology**, 11thEdition; Jaypee Brothers Medical Publishers.General Anatomy and Physiology – by DrVenkatesh
4. Surface and Radiological Anatomy- with a Clinical Perspective- by DrAshwini C A, 1st Edition,
5. Jaypee Publishers, New Delhi

2. Recommended Reading

1. Anne Waugh, Allison Grant; 2018; Ross & Wilson **Anatomy and Physiology in Health andIllness,** 13th edition; Elsevier Churchill Livingstone.
2. Adam W.M. Mitchell, Richard Drake, A. Wayne Vogl; **Gray's anatomy for Students**; 3rdedition; Elsevier Churchill Livingstone.

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9. Course Organization

Course		General Anatomy
Course		AHD101A
Course Leader/s Name		
Course Leader Contact Details	**Phone:**	080 – 49065555
	E- mail:	
Course Specifications Approval		June 2022
Next Course Specifications Review		June 2026

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Course Specifications: General Physiology

Course Title	General Physiology
Course Code	AHD 102A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

1. Course Summary

1. Aim and Summary

The course aims to impart basic knowledge and sufficient exposure to the physiological concepts and principles with emphasis on applied aspects of organ systems in the body, and to provide the foundations needed for further studies in pharmacology, pathology, pathophysiology and medicine. The mechanisms of deranged function will be appreciated with an in-depth understanding of basic biophysical and physiological mechanisms. The purpose of developing these core competency criteria is to provide guidelines for the breadth and depth of knowledge in the physiological principles and concepts that are considered minimal and essential for further progress in understanding mechanisms of disease and body defenses.

2. Course Size and Credits:

Number of credits	03
Total Hours of Classroom Interaction	30
Number of practical/hours	15
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course Marks	Total Marks: 100
Pass Requirement	As per University regulations
Attendance Requirement	As per University regulations

3. Teaching, Learning and Assessment

Course Outcomes (COs)

After undergoing this course students will be able to:

CO1. Describe the functions of the organ systems in the body
CO2.Explain the mechanisms for the execution of these functions for homeostasis through the secretions of chemical and humoral factors
CO3. Explain the regulatory mechanisms in the control of blood pressure, urine formation maintenance of extracellular and intracellular volume
CO4. Perform to assess the normal values and parameters of the bodily functionindicators such as blood indices, blood gases
CO5. Demonstrate the tests to assess the functional integrity of the respiratoryand cardiovascular system
CO6. Correlate the disease condition with physiological aspects of bodily functions

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4. Course Contents

THEORY

Unit 1: Blood

Composition and function of blood, blood bank, blood transfusion, erythrocyte sedimentation rate (ESR) and packed cell volume, anemia, body fluids.

Unit 2: Cardiovascular System
Heart and its muscles, cardiac output, heart sounds, blood pressure, hypertension,ECG.

Unit 3: Digestive System
Physiological anatomy of gastro intestinal tract, functions of digestive system,salivary gland's structure and functions, deglutition, stomach, gastric secretion, pancreas, functions of liver, gall bladder, intestine and lipids.

Unit 4: Respiratory System
Functions of respiratory system, physiological anatomy of respiratory system. Mechanism of normal and rigorous respiration. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall. Transportation of respiratory gases lungvolumes and capacities, regulation of respiration.

Unit 5: Endocrine System
Definition classification of endocrine glands & physiological, anatomy, hormone secreted, physiological function, and their hormones functions of endocrine glands regulation of secretion. Disorders - hypo and hyper secretion of hormone.

Unit 6: Nervous system
Functions of nervous system, neuron structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory. Velocity of impulse. Synapse - Structure, types, properties. Receptors and synapses - Definition, classification, properties. Reflex action - Unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, descending tracts - pyramidal tracts - extrapyramidal tracts. Functions of brain EEG. Cerebro spinal fluid (CSF): Formation, circulation, properties, composition and functions lumbar puncture. Autonomic nervous system: sympathetic and parasympathetic distribution and functions and comparison of functions.

Unit 7: Excretory System
Functions of kidneys structural and functional unit nephron, vasarecta, cortical and juxtamedullary nephrons: sites of reabsorption, substance reabsorbed, mechanismsof reabsorption glucose, urea.h + Cl amino acids etc. Tmg, tubular lead, renal threshold % of reabsorption of different substances, selective secretion. Properties and composition of normal urine, urine output. Abnormal constituents in urine, mechanism of urine concentration. Counter - current mechanisms: micturition, innervation of bladder, cystometrogram. Diuretics: water, diuretics, osmoticdiuretics, artificial kidney renal function tests - plasma clearance actions of Adh, aldosterone and Pth on kidneys. Renal function tests

Unit 8: Reproductive System
Function of reproductive system, puberty, male reproductive system. Functions of testes, spermatogenesis site, stages, factors influencing semen. Endocrine functions of testes. Androgens - testosterone structure and functions. Female reproductive system. Ovulation, menstrual cycle.

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Physiological changes during pregnancy, pregnancy test. Lactation: composition of milk factors controlling lactation.

Unit 9: **Muscle Nerve Physiology**
Classification of muscle, structure of skeletal muscle, sarcomere contractile proteins, neuromuscular junction. Transmission across, neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue rigor mortis

LABORATORY:

1. White Blood Cell Count
2. Red Blood Cell Count
3. Blood Pressure Recording SL
4. Auscultation of Heart Sounds
5. Artificial Respiration SL
6. Pulmonary Function Test

5. CO-PO PSO Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2			1					2			
CO-2	2								2			
CO-3	2				1				2			
CO-4	2		1		1				2			
CO-5	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 Durationin Hours
Face to Face Lectures		20
Demonstrations		2
1. Demonstration using Videos	2	
2. Demonstration using PhysicalModels/Systems	-	
3. Demonstration on a Computer	-	
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory	25	
2. Computer Laboratory	-	

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3. Engineering Workshop/Course Workshop/Kitchen/ OSPE	-	30
4. Clinical Laboratory	5	
5. Hospital	-	
6. Model Studio	-	
Others		
1. Case Study Presentation/ Case Studies	3	8
2. Guest Lecture	-	
3. Industry/Field Visit	-	
4. Brain Storming Sessions/ Seminar	6	
5. Small Group Discussions	10	
6. Discussing Possible Innovations	-	
Term Test, Laboratory Examination and Written Examination		10
Total Duration in Hours		70

7. Course Assessment and Reassessment

The components and subcomponents of course assessment is presented in the Academic Regulations document pertaining to the programme. The procedure to determine the final course marks is also presented in the Academic Regulations document as well.

The assessment questions are set to test the course learning outcomes. In each component or subcomponent, certain Course Outcomes are assessed as illustrated in the following Table.

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

8. Achieving Course Learning Outcomes

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

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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. Gerard J. Tortora, Bryan H. Derrickson (2013) Principles of Anatomy and Physiology 14th Edition.Wiley publications
2. Sujit Kumar Chaudhuri (2011) Concise Medical New Central Book
3. Chatterjee CC(2005) Human Physiology Volume 1 and 2 11th edition CBS publishers
4. D. Venkatesh, H.H. Sudhakar (2015)Textbook of Medical Physiology. Lippincott Williams &Wilkins

b. Recommended Reading

1. Guyton and Hall (2016) Textbook of Medical Physiology,
2. 13edition Elsevier's publicationsParveenKumar and Michel Clark (2016) Kumar and Clark's Clinical Medicine Ninth editionGanong's Review of Medical Physiology
3. 24th Edition (LANGE Basic Science) 24th Edition

c. Magazines and Journals

d.Websites

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Course Specifications: Health Care Delivery Systems of India

Course Title	Health Care Delivery Systems of India
Course Code	AHD 103A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

1. Course Summary

1. Aim and Summary

The aim of the course is to introduce students to the Indian system of health care, health status ofthe population and initiatives taken at the national level towards improving health status of the population.The students are oriented to importance of demography and vital statistics and concept of healthand disease. The students are exposed to health care delivery systems such as- Siddha, Unani, Homeopathy, Ayurveda and Yoga and Naturopathy. Students are also introduced to concept of integrating health care system to achieve health, measures taken at National level for improving health status of population including National Health programmes.

2. Course Size and Credits:

Number of credits	02
Total hours of class room interactionduring the semester	30
Number of practical/tutorial hours	0
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 50
Pass requirement	As per the academic regulations
Attendance requirement	As per the academic regulations

3. Teaching, Learning and Assessment

Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course outcome
1.	Describe the Health Care delivery system in India at primary, secondary andtertiary level and identify their role in the health care team

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2.	Explain the AYUSH system of medicine
3.	Explain the National Health programmes in terms of operation,achievements and constraints
4.	Explain the importance of Demography and Vital statistics in planning health policy
5.	Discuss role of epidemiology and epidemiological methods in health

4. Course Contents:

Introduction to healthcare delivery system • Healthcare delivery system in India at primary, secondaryand tertiary care Community participation in healthcare delivery system • Health system in developed countries Private Sector National Health Mission; National Health Policy and issuesin health care delivery system in India
National Health Programme • Background objectives, action plan, targets, operations, achievements andconstraints in various National Heath Programme
Introduction to AYUSH system of medicine • Introduction to Ayurveda Yoga, naturopathy, unani, siddha and homeopathy Need for integration of various system of medicine
Health scenario of India- past, present and future
Demography & Vital Statistics • Demography – its concept. Vital events of life & its impact on demography • Significance and recording of vital statistics. Census & its impact on healthpolicy
Epidemiology • Principles of Epidemiology. Natural history of disease • Methods of epidemiological studies Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizingagents, cold chain, immunization, disease monitoring and surveillance

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					PSO -1	PSO -2	PSO -3	PSO -4
CO-1		1		2	1		2						2			1

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CO-2	1		1										2			
CO-3			1	2	1			1					2			
CO-4		1		1	1		2						2			
CO-5	1			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		25
Demonstrations		
2. 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		05
4. Brain Storming Sessions		
5. Group Discussions	05	
6. Discussing Possible Innovations		
Written Examination (Mid-Term tests and SEE)		05
Total Duration in Hours		35

7. Method of Assessment

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

CE (60% weightage)	**SEE (40% weightage)**

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SC1 (Term Tests) 30%	SC2 (Innovative assignment) 10%	SC3 (Written assignment) 20%	SEE (Theory) 40 %.

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission
l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40%in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

C. Achieving learning outcomes

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

Sl . No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Class room lectures
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions
6.	Practical Skills	Case discussions
7.	Group Work	case study and group discussions

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8.	Self-Learning	Seminars
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Seminars, Case discussions
12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions
14.	Leadership Skills	Group discussions

9. Course Resources

a. Essential Reading

Community Medicine with recent advances - AH Suryakantha - 4th Edition - Jaypee PublishersReview in Community Medicine - VVR SeshuBabu - 2nd Edition - Paras Medical Books Epidemiology for Undergraduates - Marina Rajan Joseph - Jaypee Publishers

b. Recommended Reading

Park's Textbook of Preventive and Social Medicine - K. Park - 22nd Edition - BhanotPublishers Oxford Textbook of Public Health - Roger Detels - 5th Edition - Oxford University PressNational Health Programs of India - J Kishore - 12th Edition - Century Publications

c. Magazines and Journals

d. Websites

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Course Specifications: General Microbiology

Course Title	General Microbiology
Course Code	AHD 104A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

1. Course Summary

1. Aim and Summary

This course introduces the principles of Microbiology with emphasis on applied aspects of Microbiology of infectious diseases particularly in the Principles & practice of sterilization methods, collection and dispatch of specimens for routine microbiological investigations, interpretation of commonly done bacteriological and serological investigations, and control of hospital infections. This will help the students to maintain sterile working environment and appropriate sample collection.

2. Course Size and Credits

Number of credits	03
Total hours of class room interaction during the semester	30
Number of practical hours	30
Number of semester weeks	16
Department responsible	Allied Health Sciences.
Course marks	Total Marks: 100
Pass requirement	As per the academic regulation
Attendance requirement	As per the academic regulation

3. Teaching, Learning and Assessment

Course Outcomes

After undergoing this course students will be able to:

No.	Course outcome
1	Describe the morphology, physiology and characteristics of microorganisms
2	Describe the principles and practice of sterilization and disinfection

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3	Discuss immunology, and immunity
4	Demonstrate sterilization procedures and use of sterilization equipment
5.	Demonstrate Collection and transport of specimens to the laboratory

4. Course Contents

Course Content
Introduction to Microbiology History, introduction, scope, aims and objectives. Morphology and physiology of bacteria. Detail account of sterilisation and disinfection. Brief account of culture mediaand culture techniques. Basic knowledge of selection, collection, transport, processingof clinical specimens and identification of bacteria and drug resistance in bacteria
Immunology Infection - Definition, Classification, Source, Mode of transmission and types of Infectious disease. Immunity. Structure and functions of Immune system. The Complement System. Antigen. Immunoglobulins - Antibodies - General structure and the role playedin defence mechanism of the body. Immune response. Antigen - Antibody reactions - with reference to clinical utility. And hypersensitivity reactions.
Systematic bacteriology Pyogenic cocci - Staphylococcus, Streptococcus, Pneumococcus, Gonococcus, Meningococcus – brief account of each coccus– detailed account of mode of spread, laboratory diagnosis. Mycobacteria - Tuberculosis and Leprosy. Clostridium - Gas gangrene, food poisoning and tetanus. Non-sporing Anaerobes - in brief about classification and morphology,in detail aboutViruses: HIV and Hepatitis- Pathogenesis, Lab Diagnosis and management
Laboratory: Demonstration of sterilization equipment's: hot air oven, autoclave, bacterial filters. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, MacConkey medium, LJ media, Robertson cooked meat media.Anaerobic culture methods. Antibiotic susceptibility test. Demonstration of common serological tests: ELISA.Demonstration of Grams staining. Demonstration of Acid fast staining. Sample collection methods, storage and transport.

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	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1								2			

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CO-2	2		1		1				2			
CO-3	1		1						2			
CO-4	2				1				2			
CO-5	2	1		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		24
Demonstrations		00
1. Demonstration using Videos	-	
2. Demonstration using Physical Models/Systems	00	
3. Demonstration on a Computer	-	
Numeracy		00
1. Solving Numerical Problems	-	
Practical Work		26
1. Course Laboratory	16	
2. Computer Laboratory	-	
3. Engineering Workshop/Course Workshop/Kitchen	-	
4. Clinical Laboratory	05	
5. Hospital	05	
6. Model Studio	-	
Others		02
1. Case Study Presentation	02	
2. Guest Lecture	-	
3. Industry/Field Visit	-	
4. Brain Storming Sessions	-	
5. Group Discussions	00	
6. Discussing Possible Innovations	-	
Term Test, laboratory and Written Examination		08
Total Duration in Hours		60

7. Method of Assessment

CE (60% weightage)	SEE (40% weightage)

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SC1 (Term Tests) 30%	SC2 (Innovative+ . Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

Online Test:

a) Assignments/Problem Solving
b) Field Assignment
c) Open Book Test
d) Portfolio
e) Reports
f) Case Study
g) Group Task
h) Laboratory / Clinical Work Record
i) Computer Simulations
j) Creative Submission
k) Virtual Labs
l) Viva / Oral Exam
m) Lab Manual Report
n) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving Learning Outcomes

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

Sl. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Lecture
2.	Understanding	lecture
3.	Critical Skills	Assignments, case study discussion,small group discussion

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4.	Analytical Skills	Assignments, case study discussion,small group discussion
5.	Problem Solving Skills	Assignments
6.	Practical Skills	-OSPE
7.	Group Work	Assignments
8.	Self-Learning	Assignment, OSPE
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	Small group discussion
11.	Presentation Skills	Small group discussion
12.	Behavioral Skills	-
13.	Information Management	Assignment
14.	Personal Management	-
15.	Leadership Skills	-

9. Course Resources

a. Essential Reading

- Class notes
- Ananthnarayan, R. &Panicker, C.K.J., 2009. Textbook of Microbiology. 8th ed. Hyderabad:Universities Press (India) Pvt. Ltd.
- Evan Roitt et al, Immunology. 3rd ed. USA: McGraw Hill Companies Inc.

b. Recommended Reading

- Apurba S. Sastry & Sandhya Bhat K; Essentials of medical Microbiology. Jaypee. The healthSciences Publisher

c. Magazines and Journals

d.Websites

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Course Title	Basic Electrical & Electronics
Course Code	AHD106A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

1. Course Summary

Aim and summary:

This course deals with basic principles and concepts of Elements of Electrical and Electronics as applied to biomedical instrumentation. Students are taught the fundamentals of circuit analysis, magnetic circuits, DC machines and transformers. In addition, principles of PN junction diode, Zener diode, semiconductor devices such as transistors, amplifiers and power supplies.

2. Course Size and Credits

Number of credits	03
Total hours of class room interactionduring the semester	45
Number of tutorial hours	30
Number of semester weeks	16
Department responsible	Electrical and Electronic Engineering
Course marks	Total Mark: 100
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes

After undergoing this course students will be able to:

No.	Course Outcome
1	State various laws of electric and magnetic circuits and explain theirsignificance in biomedical instrumentation
2	Explain DC machines, transformers and their applications

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3	Solve simple numerical problems on electric circuits and magnetic circuits,
4	Explain working principles of PN junction diode, Zener diode, transistors andamplifier configurations
5	demonstrate electrical and electronic circuits for hardware modules using standard EDA tool

4. Course Contents

Course Content
DC and AC Fundamentals: Circuit elements, Voltage and Current Division, Ohm's Law and Kirchhoff's Laws, Sinusoidal voltage and currents, concept of cycle period, frequency, peak factorand form factor, phase difference, lagging, leading and in phase quantities. Study of AC circuits of pure R, L and C.
Magnetic Circuits: Magnetic effect of electrical current, Faraday's law of electromagnetic induction, statically and dynamically induced EMF's, self and mutual inductance, concepts of MMF, flux, flux density, reluctance, permeability and field strength, their units andrelationship. Simple series and parallel magnetic circuits. Basic analogy between electric and magnetic circuits.
DC Machines and Transformers: Constructional details, working principle and methods of excitation of DC machineas a generator and a motor. Necessity of transformer, Constructional Details (coreand shell types), Principle of operation, Ideal Transformer and Practical Transformer. Applications of DC machines and transformers in medical instrumentation.
Basic concepts in Electronics: Semiconductor: p-type, n-type; p-n junction diode, its characteristics, half wave, full wave and bridge type rectifiers, basic filter circuits, Zener diode characteristics,Zener diode as a voltage regulator.
Transistors: Transistor configurations: CB, CE and CC; Transistor parameters: alpha, beta andgamma, working of transistor as a switch, Amplifier, Characteristics of JFET,.
Amplifiers: Differential amplifiers and their transfer characteristics, IC Op-Amps, their ideal and practical characteristics, Op-Amp in different modes as inverting amplifier, non- inverting amplifier, summing amplifier, scale changer, differentiator and integrator.
Lab course Design and simulate following circuits using standard EDA tool 1. Verification of Ohms Law. 2. Verification of KVL and KCL 3. Verification of series circuit 4. Verification of parallel circuits 5. Characteristics of p-n junction diode 6. Characteristics of Zener diode

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7. Half wave rectifierFull wave rectifier

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	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			2		2			1	2			1
CO-2			2		1				2			
CO-3					2				2			
CO-4			2		1				1			
CO-5					1				1			
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution												

7. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Durationin Hours
Face to Face Lectures		24
Demonstrations		04
1. Demonstration using Videos	04	
2. Demonstration using Physical Models / Systems	-	
3. Demonstration on a Computer	-	
Numeracy		04
1. Solving Numerical Problems	4	
Practical Work		20
1. Course Laboratory	20	
2. Computer Laboratory	-	
3. Engineering Workshop / Course Workshop / Kitchen		
4. Clinical Laboratory	-	
5. Hospital	-	
6. Model Studio	-	
Others		00
1. Case Study Presentation	-	
2. Guest Lecture	-	
3. Industry / Field Visit	-	

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4. Brain Storming Sessions	-	
5. Group Discussions	0	
6. Discussing Possible Innovations	-	
Term Tests, Laboratory Examination / Written Examination, Presentations		8
Total Duration in Hours		60

8. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The Innovative assignment subcomponents can be of any of the following types:

o) Online Test
p) Assignments/Problem Solving
q) Field Assignment
r) Open Book Test
s) Portfolio
t) Reports
u) Case Study
v) Group Task
w) Laboratory / Clinical Work Record
x) Computer Simulations
y) Creative Submissionaa) Virtual Labs
bb) Viva / Oral
Exam cc) Lab
Manual Report
dd) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

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9. Achieving Learning Outcomes

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	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Assignments
4.	Analytical Skills	Class room lectures, Assignments
5.	Problem Solving Skills	Class room 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	
12.	Behavioral Skills	Course work
	Information Management	Assignment, Examination
	Personal Management	Course work
15.	Leadership Skills	

10. Course Resources

a. Essential Reading

- Class Notes
- Edward Hughes, (2002), Electrical and Electronics Technology, ELBS, 6th edition
- Millman and Halkias, (2001) Integrated Electronics, Tata McGraw-Hill Education

b. Recommended Reading

- Mittle, V.N., (2007) Basic Electrical and Electronics Engineering, Tata McGraw Hill Edition, New Delhi, 1st edition
- Delton Horn T., (1993) Abraham Pallas, Basic Electricity and Electronics, Europe, McGraw-Hill Limited

c. Websites

- Basic Electrical Technology (2013) http://freevideolectures.com/Course/2335/Basic-Electrical-Technology/23
- IITM Lectures (2013) http://www.nptel.iitm.ac.in/courses/108105017/

d. Other Electronic Resources

- Electronic resources on the course area are available on MSRUAS library

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Course Title	Applied Physics
Course Code	AHD105 A
Department	Applied Physics
Faculty	Life and Applied Health Sciences

Course Summary

1. Aim and Summary

The aim of this course is to impart basic concepts of Physics and its application to solve medical problems. The students are taught the basic topics in physics which include electromagnetic theory, electricity and magnetism, lasers and fiber optics. Interaction of radiation with matter will be discussed.

2. Course Size and Credits

Number of credits	3
Total hours of class room interaction during the semester	30
Number of Laboratory hours	30
Number of semester weeks	16
Department responsible	Faculty of Mathematical & Physical
Course marks	Total marks: 100
Pass requirement	As per the academic regulations
Attendance requirement	As per the academic regulations

Teaching, Learning and Assessment

3. Course Outcomes

After undergoing this course students will be able to:

No.	Course Outcome
1	Explain the basic concepts in sound, electricity and magnetism, laser physics and electromagnetic radiation
2	Describe concepts in optical fibers,

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3	Describe basic properties of fluids
4	Conduct experiments as per the standard procedures and tabulate the measured values
5	Calculate the required parameters and plot the results
6	Interpret, compare with standard results and draw conclusions

4. Course Contents

Course Content
Basic Physics: Sound -The nature and propagation of sound wave (the characteristics of sound, wave theory), speed of sound in a material medium, intensity of sound, the decibel, Interference of sound waves, beats, diffraction, Doppler effect , Applications of Doppler effect
Optical fiber : **Basic working principle of optical fibers : Types and structure of Optical fibers, modes of propagation,** Refractive index profiles of step index and graded index fibers, Attenuation, Different types of loss mechanisms, Fiber optic application in medical field.
Electricity and Magnetism: A.C. and D.C. power supply with examples, single phase and poly phase power supply, switches, fuses, circuit breakers, earthing etc. main voltage drop: causes and remedy, cables; low tension, high tension. Magnets and magnetic field, force on an electric current in a magnetic field, force on electric charge moving in a magnetic field, Ampere's law, electromagnet and solenoids
Electromagnetic radiation: Electromagnetic radiation spectrum, common properties of electromagnetic radiation; relationship between energy, frequency, wavelength and velocity e.g. X-rays and gamma rays. Transmission through matter, law of exponential attenuation- practical aspects of radiation absorption and transmission through body tissues
Characteristics of laser light, Absorption, spontaneous emission and stimulated emission, Requisite conditions for production of a laser beam, Nd-YAG Laser, Semiconductor laser, Applications of laser to medical field
Fluid mechanics: Rate of flow —lines and tubes of flow—Streamline and turbulent flow— Bernoulli's theorem and its applications-Reynold's number- viscosity —Derivation of Poiseuille's equation –Experimental determination of viscosity of a liquid, Surface tension—capillary rise Diffusion—Fick's law—Graham's law for diffusion of gases, biomedical applications
Basic Physics Laboratory: Study with charts, models & power point presentations- Perform experiments on electricity& magnetism, waves and light radiation. Carry out experiments related to wave properties of light and particle nature of light using laser source. Effect of radiation on matter-inverse square law.

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5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			2		2			1	2			1
CO-2			2		1				2			
CO-3					2				2			
CO-4			2		1				1			
CO-5					1				1			
CO-6					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		25
Demonstrations		0 3
1. Demonstration using Videos	3	
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer	-	
Numeracy		0
1. Solving Numerical Problems	-	0
Practical Work		18
1. Course Laboratory	18	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen	-	
4. Clinical Laboratory	-	
5. Hospital	-	
6. Model Studio	-	
Others		6
1. Case Study Presentation	-	
2. Guest Lecture	-	
3. Industry/Field Visit	-	
4. Brain Storming Sessions	-	

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5. Group Discussions	6	
6. Discussing Possible Innovations		
Term Tests and Written Examination		08
Total Duration in Hours		60

7. Method of Assessment

In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission
l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning Outcomes

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
	Understanding	Class room lectures,
3.	Critical Skills	Assignment
4.	Analytical Skills	Class room, assignment
5.	Problem Solving Skills	Class room, assignment
6.	Practical Skills	Class room, assignment

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7.	Group Work	Classroom
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, examination
14.	Personal Management	Assignment, examination
15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

- Class notes
- David Halliday, Robert Resnick and Jearl Walker, (2013) *Fundamentals of Physics*, New York,John Wiley & Sons.
- Murugeshan, R., (2008) *Electricity and Magnetism*, 7th Edition, S. Chand and Company
- Arora, C. L., (2007) *B.Sc. Practical Physics*, S. Chand and Company Ltd.
- William E. J McKinneyRadiographic latent image processing –American Society forNondestructive Testing (1982)
- W. J. Meredith & J.B. Massey. Fundamental Physics of Radiology 1992(Varghese PublishingHouse).
- Robin J. Wilks, Principles of Radiological Physics, 2nd Revised edition (Oct. 1 1987)ChurchillLivingstone;
- George A. Hay , Donald J. Hughes First-year Physics for Radiographers 3rd Revised edition(1997) BaillliereTindall;

b. Recommended reading

- Basic Medical Radiation physics – by L Stanton Stanton 1963 (Butterworth)
- Thomas S. Curry III James E. Dowdey, Robert E. Murry Jr. Christensen's Physics of Diagnostic Radiology Fourth EditionLWW (August 1, 1990)
- Thayalan, K., (2003) Basic Radiological Physics,New Delhi, Jayapee Brothers Medical Publishing Pvt. Ltd.
- Bushberg, Seibert, Leidholdt and Boone,(2002)The essential physics of Medical Imaging,North America, Lippincot Williams and Wilkins.

c. Magazines and Journals: -

d. Websites

- www.ocw.mit.edu/courses/physics

e. Other Electronic Resources

- http://nptel.ac.in/

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

B.Sc. (Hons) in Cardiac Care Technology 2022-2023

SEMESTER 2

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Course Title	General Biochemistry
Course Code	AHD 107A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

1. Course Summary

1. Aim and Summary

The course aims to impart basic knowledge on biochemistry and its role in health and diseases, emphasizing on the diagnostic aspect of the subject. The course is designed to provide an understanding of the basic process of life in molecular terms. The students are oriented to chemistry of carbohydrates, proteins, lipids, and various metabolic pathways to understand and utilize different biomolecules, nutrition, and nutritional support with special emphasis on parentalnutrition. Students learn about specimen collection, and different laboratory apparatus used and reparation of solutions. They are exposed to the concept of quality control. They will perform routine urine and blood investigations and interpret and diagnose abnormalities.

2. Course Size and Credits:

Number of credits	02
Total hours of class room interaction during the semester	30
Number of practical/tutorial hours	00
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 50
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations

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Teaching, Learning and Assessment

3. Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course outcome
1.	Describe the various laboratory apparatus used, the steps in specimen collection and safety measurements to be taken in biochemistry laboratory
2.	Explain different models of atomic structure, acids, bases, buffers and disturbances in acid base balance
3.	Explain quality control, precision, specificity, sensitivity when conducting special investigations
4.	Demonstrate qualitative and quantitative estimations of various analyses (urine, blood)
5.	Interpret the various biochemical parameters in health and disease

4. Course Contents:

Specimen collection Pre-analytical variables. Collection of blood. Collection of CSF & other fluids. Urine collection. Use of preservatives. Anticoagulants.
Introduction to laboratory apparatus Pipettes: different types (graduated, volumetric, Pasteur, automatic etc. Calibration of glass pipettes. Burettes, beakers, petri dishes, depression plates. Flasks: different types (volumetric, round bottomed, Erlenmeyer conical etc.).Funnels: different types (conical, Buchner etc.).Bottles: reagent bottles – graduated and common, wash bottles different type specimen bottles
Instruments Use, care and maintenance of: water bath, oven & incubators, water distillation plant, water deionizers, refrigerators, cold box, deep freezers, reflux condenser, centrifuge, balances, colorimeter, spectrophotometer, pH meter and electrodes. Centrifuges: definition, principles, Svedberg unit, centrifugal force, centrifugal field, RPM, conversion of G to RPM and vice versa, different types of centrifuges. Manual balances: single pan, double pan, triple balance, direct read out electrical balances.
Safety of measurements & Conventional and SI units
Dilutions
Acids & Bases
Acid- base indicator Theory
Quality control

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					PSO -1	PSO -2	PSO -3	PSO -4
CO-1		1	1		2								2			

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CO-2					2								2			
CO-3	1				2								2			
CO-4	2				2								3			
CO-5	2				2								2			
CO-6	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		25
Demonstrations		
3. Demonstration using Videos	05	
2. Demonstration using Physical Models/Systems		0
3. Demonstration on a Computer		5
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 (Mid-Term tests and SEE)		05

Total Duration in Hours	35

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7. Method of Assessment

CE (60% weightage)	SEE (40% weightage)

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SC1 (Term Tests) 30%	SC2 (Innovative assignment) 10%	SC3 (Written assignment) 20%	SEE (Theory) 40 %

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission
l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40%in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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

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

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9 Course Resources

a. Essential Reading

- Vasudevan, D.M., Sreekumari, S., Vaidyanathan, K. Textbook of Biochemistry for MedicalStudents, Jaypee Brothers Medical Publishers, New Delhi, 8th Ed, 2016
- Satyanarayana U, Chakrapani U. Biochemistry. Books & Allied (P) Ltd, Kolkata 4th Ed, 2013

b. Recommended Reading

- Murray Rk, GrannerDk, RochwellVw. Harper's Illustrated Biochemistry, Lange McGraw Hill, New York, 30th Ed, 2015
- Champe Pc, Harvey Ra, Ferrier Dr. Lippincott's Illustrated Reviews Biochemistry, Wolters Kluwer Health, Lippincotts Williams & Wilkins, New Delhi, 6th Ed, 2013
- DasDebjyoti, Fundamentals of Biochemistry books & allied, Kolkata 14th Ed, 2012
- Varley , Clinical chemistry 4th edition
- Teitz , Fundamentals of clinical chemistry 6th edition

c. Magazines and Journals

- Journal of clinical chemistry and laboratory medicine
- Indian journal of medical biochemistry

d. Websites

10. Course Organization

Course Title		General Biochemistry
Course Code		19AHG111A
Course Leader/s Name		
Course Leader Contact Details	**Phone:**	080 – 49065555
	E- mail:	
Course Specifications Approval		June 2022
Next Course Specifications Review		June 2026

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Course Title	General Pharmacology
Course Code	AHD108A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

1. Course Summary:

1. Aim and Summary

The aim of the course is to introduce students of allied health sciences to the Pharmacological basis of therapeutics. This should help them to understand therapeutics in management of various diseases.

Pharmacology, the science of drugs, has special reference to the students of allied health sciences. Practice of various technologies involves use of pharmacological agents both for diagnosis and treatment. The students are oriented to importance of pharmacological basis of therapeutic intervention. Broad understanding of pharmacology with emphasis on how human body handles a drug is imperative to these students.

2. Course Size and Credits:

Number of credits	02
Total hours of class room interaction during the semester	30
Number of practical/tutorial hours	00
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 50 As per academic regulations
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations

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3. Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course Outcome
1.	Describe pharmacokinetic principles in relation to drug administration
2.	Explain the concept of pharmacodynamics in relation to drug utilization in Therapeutics
3.	Explain the concept of chemotherapy in relation to infectious diseases
4.	Explain the importance of adverse effects in therapeutics of various drug Usage
5.	Identify drugs dosage forms and posology in management of diseases and calculate doses in various age groups
6.	Interpret the importance of drug combinations with reference to therapeutic index and drug utilization

4. Course Contents:

General Pharmacology Introduction to pharmacology-various terminologies-sources & routes of drug administration – Absorption & Factors modifying drug absorption – Distribution of drugs – Metabolism: Phase II, - Excretion: routes, modes & kinetics of elimination – Excretion – Mechanism of drug action in brief, synergism & antagonism and Factors modifying drug action – Adverse drug reactions – ADR reporting & monitoring – Drug Interactions
Pharmacokinetics Pharmacokinetics and dynamics of drugs acting on Central Nervous System & Respiratory System Introduction to CNS and Neurotransmitters, drugs used in insomnia, Sedatives and hypnotics
Safety and efficacy of drugs acting on Cardio vascular system & blood. Drugs used in Ischemic Heart Disease-nitrates-Calcium channel, immunomodulators , hormones
Drug use in children and geriatric population with reference to antimicrobials.

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

	Programme Outcomes (POs)	Programme Specific Outcomes (PSOs)

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	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8					PSO -1	PSO -2	PSO -3	PSO -4
CO-1	2			2	2								2			
CO-2	2			1	2								2			
CO-3	2				2								2			
CO-4	3				2			1					3			1
CO-5	2				2			1					2			1
	2			1	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		25
Demonstrations		05
1. Demonstration using Videos	05	
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		
7. Journal club		
Written Examination (Mid-Term tests and SEE)		05
Total Duration in Hours		35

7. Method of Assessment

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CE (60% weightage)			SEE (40% weightage)
SC1 (Term Tests) 30%	SC2 (Innovative assignment) 10%	SC3 (Written assignment) 20%	SEE (Theory) 40%

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission
l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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

S.No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Class room lectures
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions

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6.	Practical Skills	Case discussions
7.	Group Work	case study and group discussions
8.	Self-Learning	Seminars
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Seminars, Case discussions
12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions
15.	Leadership Skills	Group discussions

9. Course Resources

a. Essential Reading

- Essentials of Medical Pharmacology: K.D. Tripathi, 6th edition, Jaypee Publishers
- Medical Pharmacology. S K Shrivastava. Avichal publishing NewDelhi
- Manual of Practical Pharmacology. Avichal Publications.

b. Recommended Reading

- Lippincott's Illustrated Reviews: Pharmacology, 5th edition, by Richard A. Harvey and Pamela C. Champe, Lippincott Williams & Wilkins Publisher
- Katzung's Basic and Clinical Pharmacology 13th edition. Lange Publication.

c. Magazines and Journals: -

d. Websites: -

10. Course Organization

Course title		General Pharmacology
Course code		19AHG112A
Course Leader/s Name		
Course Leader Contact Details	**Phone:**	080 – 49065555
	E- mail:	
Course Specifications Approval		
Next Course Specifications Review		

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Course Title	Concepts of hospital Infection Prevention
Course Code	AHD109A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement prevention of infection spreading in the health system
.The students will be introduced to aspects such as Bio medical waste management and environment safety, Infection prevention and control, Antibiotic Resistance and Disaster preparedness and management.

2. Course Size and Credits:

Number of credits	2
Total hours of class room interaction during the semester	30
Number of practical hours	-
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course marks	Total Marks: 50
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations

II. Teaching, Learning and Assessment

3. Course Outcomes

After undergoing this course students will be able to:

No.	Course Outcome
1.	Explain the steps involved in infection prevention and control
2.	Understand the working and application of CSSD
3.	Explain the importance of antibiotic resistance in the patient care and ways to prevent it

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4.	Apply the concepts of biomedical waste management to ensure clean and hazard free hospital environment

4. Course Contents

Bio medical waste management and environment safety Definition of Biomedical Waste. Waste minimization. BMW – Segregation, collection, transportation, treatment and disposal (including color coding). Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste. BMW Management & methods of disinfection. Modern technology for handling BMW. Use of personal protective equipment (PPE). Monitoring & controlling of cross infection (Protective devices)
Infection prevention and control Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)]. Prevention & control of common healthcare associated infections. Components of an effective infection control program and Guidelines (NABH and JCI) for Hospital Infection Control. Spill management
Antibiotic Resistance History of antibiotics. How resistance happens and spreads. Types of resistance- Intrinsic, acquired, passive. Trends in drug resistance. Actions to fight resistance. Bacterial persistence. Antibiotic sensitivity. Consequences of antibiotic resistance. Antimicrobial stewardship- Barriers and opportunities. Tools and models in hospitals.
Working of CSSD: Understand the concepts of sterilization, disinfection in CSSD, Structure and working of CSSD

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5. Course Mapping

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

6. Course Teaching and Learning Methods

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Teaching and Learning Methods	Duration in hours	Total Duration in Hours
FacetoFaceLectures		20
Demonstrations		
1. Demonstration using Videos	2	
2. Demonstration using Physical Models/Systems	-	2
3. Demonstration on a Computer	-	
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory	15	
2. Computer Laboratory	-	
3. Engineering Workshop/Course Workshop/Kitchen/ OSPE	-	08
4. Clinical Laboratory	5	
5. Hospital	5	
6. Model Studio	-	
Others		
1. Case Study Presentation/ Case Studies	2	
2. Guest Lecture	-	
3. Industry/Field Visit	-	00
4. Brain Storming Sessions/ Seminar	3	
5. Small Group Discussions(SGD)	10	
6. Discussing Possible Innovations	-	
Term Test, Laboratory Examination and Written Examination		8
Total Duration in Hours		38

7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)
SC1 (Term Tests) 30%	SC2 (Innovative assignment) 10%	SC3 (Written assignment) 20%	SEE (Theory) ५०%

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving
c) Field Assignment
d) Open Book Test

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e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission
l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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	Lectures
2.	Understanding	Practical. Tutorials and lectures
3.	Critical Skills	Tutorials SGD
4.	Analytical Skills	Practical
5.	Problem Solving Skills	Case studies SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminar SGD
8.	Self-Learning	SDL SGD assignment
9.	Written Communication Skills	Semester exams ,test and assignment
10.	Verbal Communication Skills	Seminar and SGD
11.	Presentation Skills	Seminar
12.	Behavioral Skills	practical
13.	Information Management	assignment
14.	Personal Management	
15.	Leadership Skills	Group discussion

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9. Course Resources
   a. Essential Reading:
      - Class notes
      - Essentials of Hospital Infection Control by Apurba Shastry

10. Course Organization

Course Code	AHD109A		
Course Title	Concepts of Hospital Infection Prevention		
Course Leader/Name		As per time table	
Course Leader Contact Details		Phone:	080-45366666
		E-mail:	
Course Specifications Approval Date		10/5/2019	
Next Course Specifications Review Date:		10/5/2023	

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Course Specifications: General Pathology

Course Title	General Pathology
Course Code	AHD110A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

The aim of the course is to introduce students of allied health sciences to concepts of general Pathology. This should help them to build a foundation for understanding pathological basis of various diseases with special reference to radiation technology and dialysis technology. The course would help integrate knowledge of basic concepts of pathology and clinical medicine into allied sciences. At the end of the course, the student will learn fundamental aspects of cellular injury, inflammation, tissue repair, immunology, neoplasia, histopathology, hematology and blood banking

2. Course Size and Credits:

Number of credits	03
Total hours of class room interaction during the semester	30
Number of practical/tutorial hours	30
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 100
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations

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II. Teaching, Learning and Assessment

3. Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course Outcome
1.	Describe basic facts and concepts of pathology
2.	Explain fundamental aspects of hematology and blood banking
3.	Explain the various clinical pathology tests
4.	Perform laboratory tests related to hematology and clinical pathology
5.	Interpret the results of laboratory tests
6.	Apply concepts of general pathology to understand pathological basis of Disease

4. **Course Contents:**

Histopathology

Introduction to histopathology. Receiving of specimen in the laboratory. Grossing techniques. Mounting techniques: various mountants. Maintenance of records and filing of the slides. Use& care of microscope. Various fixatives, mode of action, preparation and indication. Sectioncutting. Tissue processing for routine paraffin sections. Decalcification of tissues. Staining of tissues: H & E Staining. Bio-medical waste management. Frozen section cutting and staining.

Blood Bank

Introduction. Blood grouping and Rh types. Cross matching

Laboratory :

- Urine Examination: physical, chemical, microscopic.
- Blood grouping Rh typing. Cross matching (Observation), how to send samples for cross matching, PT, APTT and Hb, packed cell volume (PCV), erythrocyte sedimentation rate (ESR), bleeding tome, clotting time
- Frozen section cutting and H &E staining
- Collection, transport, and preservation, of various clinical specimens.(Urine, CSF, sputum and other body fluids)

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General Pathology

General Pathology Adaptations, Cell Injury and Repair: Hyperplasia, atrophy, metaplasia, necrosis and apoptosis - Differences between apoptosis and necrosis.

Acute and Chronic inflammation: Five cardinal signs of inflammation- Outcomes of acute inflammation- Chronic inflammation-Granulomatous inflammation-Acute phase proteins.Tissue repair, regeneration and hemodynamic disorders: Cutaneous wound healing- Pathologic aspects of repair-Hyperaemia and congestion-Thrombosis and Virchow triad- Embolism-Infarction Shock; Bronchial asthma, COPD.

Diseases of immune system: Hypersensitivity reaction-Type I, II, III, and IV hypersensitivity reactions.

Neoplasia:

Definition of neoplasia. Differences between benign and malignant tumors ; Metastasis ; Carcinogenesis – Causes ; Carcinoma of oral cavity – Causes; Etiology of Carcinoma cervix – type of virus implicated, high risk sero-types, Screening investigations; Breast carcinoma – Risk factors

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					PSO -1	PSO -2	PSO -3	PSO -4
CO-1	1				1								2			
CO-2	1		1	1									2			
CO-3	2				2								2			
CO-4	2		1		2								2			
CO-5	2			1									2			
CO-6	2		1		2			1					2		1	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution																

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		25
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical	05	
3. Demonstration on a Computer		
Practical Work		
Conducting demo interviews and focus	20	
Computer lab (software demonstration)		
Demonstrating analysis using a case study		
Others		
1. Case Study Presentation		
2. Brain Storming Sessions		
3. Group Discussions		
4. Discussing Possible Innovations		
Written Examination		10
Total Duration in Hours		60

7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

a) Online Test
b) Assignments/Problem Solving

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c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Laboratory / Clinical Work Record
j) Computer Simulations
k) Creative Submission
l) Virtual Labs
m) Viva / Oral Exam
n) Lab Manual Report
o) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8 Achieving learning outcomes

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

S.No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Case study and group discussions
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions
6.	Practical Skills	Case discussions
7.	Group Work	Case study and group discussions
8.	Self-Learning	Assignments/Reports

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9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Case discussions
12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions
14.	Leadership Skills	Group discussions

9. Course Resources

a. Essential Reading

- Sood R, (1996), Laboratory Technology- Methods and interpretation, 4th Ed. J.P. Bros, New Delhi.
- Nayak R, (2017), Textbook of Pathology for Allied Health sciences, Jaypee brothers Medical Publishers, NewDelhi.
- MdTahmiunur Rahman Sajal et al, (2013), A Short Textbook of Pathology, 2nd Ed, Jaypee, NewDelhi

b. Recommended Reading

- Gupta S, (1998) Short text book of Medical Laboratory for technician, J.P. Bros, New Delhi. Satish M Kawthalkar, (2010), Essentials of Clinical Pathology, Jaypee brothers Medical Publishers, New Delhi.
- Harsh Mohan, (2005), Textbook of Pathology, 5th Ed, Jaypee brothers Medical Publishers, New Delhi.

c. Magazines and Journals

10. Course Organization

Course		General Pathology
Course		AHD110A
Course Leader/s Name		
Course Leader Contact Details	**Phone:**	080 – 49065555
	E- mail:	
Course Specifications Approval		
Next Course Specifications Review		

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

B.Sc. (Hons) in Cardiac Care Technology
2022-2026

SEMESTER 3

Approved by the Academic Council at its 32th meeting held on 22nd June 2024

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Course Title	Basic Concepts of Cardiac Care Technology
Course code	CCC201A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

To understand and introduced to the basic concepts of cardiac care technology which includes concepts of non-invasive and invasive diagnostic tests. This course aims at imparting knowledge of basic principles of Electrocardiography, Treadmill Test, Echocardiography and role of Cardiac Catheterization, cathlab equipment personnel and its relevance in diagnosing cardiac pathologies.

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course Outcome
1.	Explain the basic principles of ECG, Echocardiography and X- Ray production in cathlab
2.	Describe normal ECG deflections, methods to assess electrical axis & methods to overcome technical artifacts in the ECG

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3.	Describe clinical applications of 2D and Doppler ECHO, importance of echo views in diagnosis and types of artifacts in echocardiography
4.	Explain guidelines for cardiac catheterization, vascular accesses and Different contrast media used in cath lab
5.	Perform ECG and interpret given ECG, basic views of 2D echo and identify cardiac structures and importance in diagnosing cardiac pathologies
6.	Demonstrate different knobs on echo machine and explain its importance in image optimization

4. Course Contents

Unit – 1 (Electrocardiography)

- Basic Principles of ECG, ECG paper, ECG Machine and its working principle
- Electrical field of the heart – Einthoven's triangle
- ECG Lead System – 12 Conventional leads, posterior leads derivation and its placement
- Basic action of electrocardiograph and recording of an ECG
- Normal ECG deflections: Normal ECG waveforms, Segments and intervals, Precardial pattern of ECG
- Electrical Axis, so called rotation of the heart
- Rate and Rhythm assessment
- Artifacts in ECG

Unit – 2 (Exercise Stress Testing)

- Introduction to Treadmill Test – Indications, Contraindications and Safety, equipment and Protocols, termination, complications, basics of Interpretation of the Exercise Test.
- Exercise Testing to Diagnose Obstructive Coronary Artery Disease - Rationale and Guidelines, Pretest Probability (true positive, false positive,true negative and false negative ST-Segment Interpretation, Confoundersof Stress ECG Interpretation.
- Result Reporting

Unit – 3 (Echocardiography)

- History of Echocardiography
- Principles of Echocardiography: Basic principles of ultrasound, modes of echo –A, B mode, M-mode, 2D echo
- Instrumentation: Basic Pulse Echo System, Transducers, Display and Recording, Knobology
- Doppler Echocardiography: Principles of Doppler echo, types, color flow imaging, clinical applications and image optimization of Doppler echocardiography
- Artifacts – 2D and Doppler artifacts

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- Basic transthoracic echo views – Transducer position, orientation and diagnostic information
- Biological Effects of Ultrasound

Unit – 4 (Cardiac Catheterization)

- Cardiac Catheterization Laboratory: Introduction and importance of cathlab,cathlab equipment, how to handle the machine, common problems one maycome across and how to overcome it.
- X – Ray theory: Electromagnetic energy, Electromagnetic radiation, Quantum theory and X-ray photons, X-ray tube and X-ray production, Radiation Safety and protocols
- Medical Asepsis: Maintaining sterility and personnel protective equipment's
- Materials used in Cathlab: Catheters, Guide wires & accessories, balloons, stents and all other materials used in cathlab, Contrast Media & radiation dose
- Guidelines for diagnostic catheterization, premedication, prerequisites, anaesthesia and sedation, Vascular access – Umbilical, femoral, subclavian,radial and internal jugular approaches

Practical Contents

Unit - 1

- ECG Machine: parts and maintenance
- ECG lead system – Types and its placement
- Technique of ECG recording
- Interpretation: Rate, rhythm and cardiac axis, morphology of wave forms
- Artifacts – Types and methods to overcome
- TMT – Indications, Contraindications, Importance of Consent, Patient preparation, Procedure, Termination of TMT, Interpretation and complications

Unit – 2

- Echocardiography: Echo machine – parts, knobs, preventive maintenanceservice
- Echo views: transducer selection, patient position, probe manipulation and orientation, Diagnosing normal cardiac structures
- Modes of Echo – principles and role in image optimization
- Doppler Echocardiography – Types, Clinical applications, advantages and disadvantages
- Artifacts – 2D, Doppler artifacts and methods to overcome it
- Biological effects of ultrasound

Unit – 3

- Cardiac Catheterization: Cathlab setup, machine – parts, working principle andits importance
- Materials used in cathlab: Catheters, Guidewires & accessories, balloons, stentsand all other materials used in cathlab, Contrast Media & radiation dose
- Radiation Safety protocols
- Medical asepsis – maintaining sterility and importance of personnel protective

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equipments

- Guidelines for diagnostic catheterization, premedication, prerequisites, anaesthesia and sedation, Vascular access – Umbilical, femoral, subclavian,radial and internal jugular approaches

5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3		1						2			
CO-2	3								1			
CO-3	3	1							3	1		1
CO-4	3	1							3	1		1
CO-5	3	1							3	1		1
CO-6	3	1							3	1		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		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		32
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
Total Duration in Hours		103

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7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE

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7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- A text book of Electrocardiography –Goldberger
- Leo Schamroth
- Feigenbaum's Echocardiography – 7th or 8th edition
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim
- Class notes

b. Recommended Reading

- ECG Made Easy – Atul Luthra
- Echo Made Easy – Atul Luthra
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5thedition

c. Journals:

- Pubmed

d. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

10. Course Organization

Course Code	**CCC201A**	
Course Title	**Basic Concepts of Cardiac Care Technology**	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Course Specifications: Clinical Cardiology

Course Title	Clinical Cardiology
Course Code	CCC202A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

To understand and describe the clinical examination, heart sounds & murmurs & chest X-ray of cardiac diseases

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial & Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course Outcome
1.	Explain the clinical examination of various cardiac diseases
2.	Describe the cardiac and non-cardiac signs and symptoms
3.	Explain the class of severity of cardiac disease based on symptoms
4.	Describe the normal & abnormal Heart Sounds & murmurs
5.	Interpret the chest X-ray findings
6.	Illustrate the diagnosis & care for patients in cardiac diseases

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4. Course Contents

Unit – 1

- History taking: NYHA functional class

Unit – 2 (Physical Examination: Signs)

- Cyanosis: Definition, Evaluation, Types - Peripheral cyanosis, Central cyanosis, Mixed cyanosis, Differential cyanosis
- Squatting, Hoarseness of voice and Hemoptysis – Etiology, Evaluation
- Pedal Edema – Etiology: Cardiac and noncardiac causes and Evaluation

Unit – 3 (Physical Examination: Symptoms)

- Chest pain: Etiology – Cardiac and noncardiac causes, Duration, Radiation, Location, Character, Angina: Chronic stable angina and Unstable angina
- Palpitation: Etiology – Cardiac & Non - Cardiac causes, Evaluation
- Fatigue – Etiology, Evaluation
- Syncope: Etiology – Cardiac & Non - Cardiac causes, Evaluation, Unknown causes
- Dyspnea: Etiology – Cardiac & Non - Cardiac causes, Pathogenesis,Paroxysmal nocturnal dyspnea, Orthopnea, Tachypnea

Unit – 4 (Pulse System)

- Arterial Pulse: Definition, Genesis, Pulse wave pattern, Examination of arterial pulse, Abnormalities in pulse volume & character
- Jugular venous pulse: Waves of JVP in normal and abnormal –conditions
- Peripheral Pulses

Unit – 5 (Heart Sounds)

- Normal Heart Sounds
- Abnormal heart sounds
- Heart murmurs and its significance in cardiac diseases

Unit – 6 (Chest X – Ray)

- Approach to chest x-ray
- Chest X-ray views and its importance, Patient positioning
- Cardiac Silhouette – identifications of cardiac structures, cardiac borders
- Cardiac chamber enlargement
- Interpretation of altered pulmonary blood flow
- Chest X-ray findings in various heart diseases

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Practicals:

- History taking
- Physical Examination
- Chest X- Ray: Indications, Patient preparation, Chest x-ray views, Patient positioning, Interpretation, Precautions to be followed

5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	3							2			
CO-2	3				1				2			
CO-3	3								2	1		
CO-4	3	1							3			
CO-5				3	1					2		
CO-6				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		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		32
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		

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6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		07
Total Duration in Hours		103

7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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

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SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9 Course Resources

a. Essential Reading

- Braunwald Heart Disease
- Hurts Heart Disease
- Moss & Adams
- Vijay Raghavan
- Alagappans

b. Recommended Reading

- Class notes

c. Journals:

- Pubmed

d. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

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10. Course Organization

Course Code	**CCC202A**	
Course Title	Clinical Cardiology	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Course Title	CCC203A
Course Code	Directed Clinical Education - 1
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

To learn about the clinical aspects of cardiac care and implement the knowledge in cardiac care technology

2. Course Size and Credits

Number of credits	9
Total hours of class room interaction during the semester	00
Number of tutorial & Laboratory hours	270
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course outcome
1.	Outline the clinical & physical examination of cardiac patients
2.	Demonstrate the working principle of ECG, ECHO & Cath lab machine
3.	Discuss the materials used in cath lab
4.	Adapt the Radiation safety protocols in Cath Lab
5.	Analyze the Normal of ECG, TMT & ECHO Reports

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4. Course Contents

Unit-1

- History taking
- Physical Examination
- Chest X- Ray: Indications, Patient preparation, Chest x-ray views, Patientpositioning, Interpretation, Precautions to be followed

Unit-2

- ECG Machine: parts and maintenance
- ECG lead system – Types and its placement
- Technique of ECG recording
- Interpretation: Rate, rhythm and cardiac axis, morphology of wave forms
- Artifacts – Types and methods to overcome
- TMT – Indications, Contraindications, Importance of Consent, Patient preparation, Procedure, Termination of TMT, Interpretation and complications

Unit – 3

- Echocardiography: Echo machine – parts, knobs, preventive maintenanceservice
- Echo views: transducer selection, patient position, probe manipulation andorientation, Diagnosing normal cardiac structures
- Modes of Echo – principles and role in image optimization
- Doppler Echocardiography – Types, Clinical applications, advantages anddisadvantages
- Artifacts – 2D, Doppler artifacts and methods to overcome it
- Biological effects of ultrasound

Unit – 4

- Cardiac Catheterization: Cathlab setup, machine – parts, working principle andits importance
- Materials used in cathlab: Catheters, Guidewires & accessories, balloons, stentsand all other materials used in cathlab, Contrast Media & radiation dose
- Radiation Safety protocols
- Medical asepsis – maintaining sterility and importance of personnel protective equipments
- Guidelines for diagnostic catheterization, premedication, prerequisites, anaesthesia and sedation, Vascular access – Umbilical, femoral, subclavian,radialand internal jugular approaches

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5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			1		3				2			
CO-2			1		3				2			
CO-3			1		3					2		
CO-4			1		3				2			
CO-5			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		00
Demonstrations		
1. Demonstration using charts	-	
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		270
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
Total Duration in Hours		270

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7. Method of Assessment

SC1 (Internal Viva)	SC2 (Logbook)
50 Marks	50 Marks

In Option 2, there shall be two subcomponents, each carrying 5 marks. Online Test
After the two subcomponents are evaluated, the CE component marks are consolidated to attain 100%Weightage.

8. Achieving learning outcomes

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

Sl. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading:

- Braunwald Heart Disease
- Hurts Heart Disease

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- Moss & Adams
- Vijay Raghavan
- Alagappans

b. Recommended Reading:
   - Class notes

c. Journals:
   - Pubmed

d. Websites:

   - https://www.onlinejase.com/
   - https://academic.oup.com/ehjcimaging

10. Course Organization

Course Code	CCC203A	
Course Title	Directed Clinical Education -1	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

B.Sc. (Hons) in Cardiac Care Technology
2022-2026

SEMESTER 4

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Course Specifications: Cardiac Evaluation and Therapies - I

Course Title	**Cardiac Evaluation and Therapies - I**
Course Code	**CCC204A**
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

To understand and describes the basic concepts, pathophysiology, diagnosis & management of coronary,Valvular, cardiomyopathies, Heart failure and peripheral vascular diseases.

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course Outcome
1.	Explain the etiology, morphology & classification of various cardiac diseases
2.	Describe the hemodynamics & pathophysiology of heart diseases
3.	Describe the diagnosis & management of cardiac diseases
4.	Explain the Diagnosis, complications & management of peripheral vascular Diseases
5.	Illustrate the clinical & physical examination myocardial infraction, Valvular heartdiseases, Heart failure
6.	Apply theoretical & practical skills to approach heart diseases by ECG &

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	Echocardiography

4. Course Contents

Unit – 1 (Acute Coronary Syndrome)

- Definition
- STEMI, NSTEMI
- Etiology
- Pathophysiology of ACS - Ischemic Cascade
- Clinical Presentation - Unstable Angina, Chronic Stable Angina
- Old Myocardial Infarction – Etiology, Clinical Presentation, Pathophysiology
- Acute MI & Chronic MI, Complications of MI

Unit – 2 (Valvular Heart Diseases)

- Rheumatic Fever – Definition, Prevalence, Clinical features, Diagnosis & Management
- Mitral Stenosis - Definition, Etiology, Pathophysiology, Clinical Presentation, Diagnosis & Management
- Aortic Stenosis - Definition, Etiology, Pathophysiology Clinical Presentation, Diagnosis & Management
- Tricuspid Stenosis & Pulmonary Stenosis - Definition, Etiology, Pathophysiology, Clinical Presentation, Diagnosis & Management
- Mitral Regurgitation - Definition, Etiology, Types, Pathophysiology Clinical Presentation, Diagnosis & Management
- Aortic Regurgitation - Definition, Etiology, Types, Pathophysiology Clinical Presentation, Diagnosis & Management
- Tricuspid & Pulmonary Regurgitation - Definition, Etiology, Types, Pathophysiology, Clinical Presentation, Diagnosis & Management

Unit – 3 (Cardiomyopathies)

- Introduction, Classification: DCM, HCM & RCM – Etiology, Pathophysiology &Clinical Presentation, Diagnosis & Management
- Infiltrative Cardiomyopathy: Cardiac Amyloidosis, Endomyocardial fibrosis, Sarcoidosis, Storage disorders: Pompe's disease, Fabry's disease
- Other variants in Cardiomyopathy: Peripartum Cardiomyopathy, LV non compaction, Arrhythmogenic RV dysplasia, Takostubo Cardiomyopathy

Unit – 4 (Infective Endocarditis)

- Definition, Etiology, Clinical findings, Diagnosis – modified dukes criteria & Management

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Unit – 5 (Heart Failure)

- Definition, Etiology, Classification, Pathophysiology, Clinical Presentation, Diagnosis & Management

Unit – 6 (Shock)

- Definition, Etiology, Classification, Pathophysiology, Clinical Presentation,Diagnosis & Management

Unit – 7 (Peripheral Vascular Diseases)

- Definition, Etiology, Classification, Pathophysiology, Clinical Presentation,Diagnosis & Management

Practicals Content

- ACS – Clinical Examination, Physical Examination, Diagnosis & Management: clinicaldecision making, timing of surgery
- Valvular Heart Diseases – Clinical Examination, Physical Examination,Diagnosis & Management: clinical decision making, timing of surgery
- Cardiomyopathies – Clinical Examination, Physical Examination, Diagnosis &Management: clinical decision making, timing of surgery
- Infective Endocarditis, Heart failure, Shock, Peripheral Vascular diseases – ClinicalExamination, Physical Examination, Diagnosis & Management: clinicaldecision making, timing of surgery

5. Course Mapping

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

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		32
Demonstrations		
1. Demonstration using charts		
Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		32
4. Hospital	-	
5. Model Studio	-	
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	32
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, and Class tests		07
Total Duration in Hours		103

7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be twoassignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test

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e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9 Course Resources

a. Essential Reading

- **ECG:**
  - Leo Schamroth
  - Mervin Goldmann
  - Marriott's Practical Electrocardiography
- **ECHO**
  - Braunwald Heart Disease

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- Hurts Heart Disease
- Moss & Adams

b. Recommended Reading
- Class Notes

c. Journals:
- Pubmed

d. Websites:
- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

10. Course Organization

Course title	Cardiac evaluation and therapies - I	
Course Code	CCC204A	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Course Specifications: Applied Cardiac Care Technology - I

Course Title	Applied Cardiac care technology - I
Course Code	CCC205A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

To understand & Describes the Non-invasive (ECG &Echo) of Ischemic, Valvular, cardiomyopathies and invasive procedures

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course Outcome
1.	Describe the ECG features in various cardiac diseases
2.	Explain Echocardiographic features of Valvular, cardiomyopathies & ischemic heart diseases
3.	Describe the usefulness of intensive coronary care unit, CCU & ICCU
4.	Explain the Cardiac catheterization procedures, complications & management
5.	Interpret ECG findings & ECHO diagnosis of Heart diseases
6.	Apply the theoretical & practical skills in cardiac catheterization,

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	interventional management

4. Course Contents

Unit – 1 (Non – Invasive Diagnostics: ECG)

- ECG in Myocardial Ischemia & Infarction, ECG criteria of Myocardial Infarction,ECG in anterior wall, inferior wall, true posterior wall and subendocardial infarction and RV MI
- ECG in Valvular heart diseases: ECG changes in rheumatic heart diseases – inMS, AS, TS & PS, ECG changes in MR, AR, TR & PR
- ECG in Cardiomyopathies
- Conduction Disturbances: SA block, AV block, Bundle branch blocks, Fascicularblocks, Sick sinus syndrome
- Chamber enlargements & Hypertrophy
- ECG in miscellaneous conditions: Myxedema, hyper and hypokalemia, Chronickidney disease
- Tilt table Test, Ankle brachial index

Unit – 2 (Echocardiography)

- Assessment of Cardiac function: measurements of all cardiac chambers and assessment of cardiac function by recommended guidelines
- Normal anatomical variants of right & left heart
- Echo in ischemic heart diseases: echo in acute MI, old MI and role of echo, complications of MI, role of echo in risk stratification and clinical decision making
- Echo in Valvular heart diseases: echo in mitral stenosis & incompetence, aortic stenosis & incompetence, Low flow low gradient AS, TS, TR & PS, PR and infective endocarditis
- Echo in Cardiomyopathies: DCM, HCM, RCM
- Stress Echo: Introduction, Applications of stress echo, Types, Indications & contraindications, Patient preparation & procedure, Protocols used, Interpretation and Complications. Role of stress echo in ischemic and valvular heart diseases

Unit – 3 (Cardiac Cath & Intervention – I)

- Cardiac Monitoring: Introduction, Purpose of cardiac monitoring, How to setup Intensive Coronary Care unit, usefulness of ICCU or CCU
- Right Heart Catheterization: Introduction, indications, contraindications
- Patient preparation & materials used, Procedure, angios done, CO measurement & its interpretation, Complications & Management
- Left Heart Catheterization: Introduction, indications, contraindications, patient preparation & materials used, Procedure, LV angios done & its interpretation, Complications & Management
- Detection, Localization and Quantification of Intracardiac Shunts: Oximetry study, flow ratio

& shunt flow calculations, Step up & step down and its significance

- Pressure measurements: Right and left heart pressure wave forms, significance of pressure measurements in diagnosing and grading the severity of cardiac diseases. Errors and corrective measures in pressure measurement
- Coronary Angiogram: Coronary vascular system, Indications & contraindications, patient preparation & materials used, Procedure - angio views, Interpretation, Complications & Management
- Peripheral Angiogram: Indications & contraindications, patient preparation &materials used, Procedure - angio views, Interpretation, Complications & Management

5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			3		1					2		
CO-2			3		1					2		
CO-3			3		2					1		
CO-4			2			3				1		
CO-5					2	3					1	
CO-6			2		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		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		32
2. Pathology Laboratory		
3. Clinical Laboratory		

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4. Hospital	-	
5. Model Studio	-	
Others		**32**
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written exam & Lab exam		07
Total Duration in Hours		103

7. Method of Assessment

CE (60% weightage)			**SEE (40% weightage)**	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be twoassignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the followingteaching and

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learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- **ECG**
  - Leo Schamroth
  - Mervin Goldmann
  - Marriott's Practical Electrocardiography
- **ECHO**
  - Braunwald Heart Disease
  - Hurts Heart Disease
  - Moss & Adams
- **CATH**
  - William Grossman
  - Eric Topols
  - Morten B Kern

b. Recommended Reading

- Class Notes

c. Journals:

- Pubmed

d. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

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10. Course Organization

Course title	Applied cardiac care technology - I	
Course Code	CCC205A	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Course Specifications: Directed Clinical education - 2

Course title	Directed clinical education - 2
Course Code	CCC206A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

To learn about the clinical aspects of cardiac care and implement the knowledge in cardiac care technology.

2. Course Size and Credits

Number of credits	12
Total hours of class room interaction during the semester	00
Number of tutorial & Laboratory hours	360
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course Outcome
1.	Interpret the ECG features in various cardiac diseases
2.	Identify the structure & function of by Echocardiography
3.	Illustrate the hemodynamics of cardiac chambers by catheterization
4.	Discuss the diagnosis & complications of cardiac procedures
5.	Formulate case study by observation different cardiac cases

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4. Course Contents

Unit – 1

- ACS – Clinical Examination, Physical Examination, Diagnosis & Management: clinical decision making, timing of surgery
- (Non – Invasive Diagnostics: ECG):
- ECG in Myocardial Ischemia & Infarction, ECG criteria of Myocardial Infarction, ECG in anterior wall, inferior wall, true posterior wall and sub endocardial infarction and RV MI
- ECG in Valvular heart diseases: ECG changes in rheumatic heart diseases – in MS, AS, TS & PS, ECG changes in MR, AR, TR & PR
- ECG in Cardiomyopathies (Echocardiography)

Unit – 2 (Echocardiography)

- Echo in ischemic heart diseases: echo in acute MI, old MI and role of echo, complications of MI, role of echo in risk stratification and clinical decision making
- Echo in Valvular heart diseases: echo in mitral stenosis & incompetence, aorticstenosis & incompetence, Low flow low gradient AS, TS, TR & PS, PR and infective endocarditis
- Echo in Cardiomyopathies: DCM, HCM, RCM

Unit – 3 (Cardiac Cath & Intervention – I)

- Right Heart Catheterization
- Left Heart Catheterization
- Coronary Angiogram
- Pressure measurements
- Peripheral Angiogram

5. Course Mapping

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

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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 charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		**360**
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		00
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
Total Duration in Hours		360

7. Method of Assessment

SC1 (Internal Viva)	SC2 (Logbook)
50 Marks	50 Marks

In Option 2, there shall be two subcomponents, each carrying 5 marks.

After the two subcomponents are evaluated, the CE component marks are consolidated to attain 100%Weightage.

8. Achieving learning outcomes

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

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SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- Braunwald Heart Disease
- Hurts Heart Disease
- Moss & Adams
- Vijay Raghavan
- Alagappans

b. Recommended Reading

- Log Book

c. Journals:

- Pubmed

d. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

B.Sc. (Hons) in Cardiac Care Technology
2022-2026

SEMESTER -5

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Course Title	Cardiac Evaluation and Therapies- II
Course Code	CCC301A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

I. Course Summary

1. Aim and Summary

This course aims to impart basic knowledge of various congenital and systemic heart diseases.The students are oriented to the concepts cardiac embryology, pathophysiology and hemodynamics of various congenital and systemic heart diseases. The students are exposed to clinical examination and are also taught the role of appropriate diagnostic tests which helps them in diagnosing various congenital and systemic heart diseases.

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course Outcome
1.	Explain cardiac embryology and its significance in classifying congenital heart diseases
2.	Describe morphology, etiology, hemodynamics and clinical features of various congenital heart diseases
3.	Describe etiologies, hemodynamics and clinical features associated with disease states including Ischemic, Myo - Pericardial & aortic heart diseases

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	and Cardiac Masses
4.	Explain the role of relevant screening and various diagnostic tests appropriate for cardiovascular risk stratification and management plan for patients with congenital and systemic heart diseases
5.	Describe etiologies, clinical presentations of various non-cardiac diseases and its effect on cardiovascular system
6.	Demonstrate how to approach and the role of non-invasive and invasive diagnostic tests in diagnosing and managing the underlying pathologies

4. Course Contents

Unit – 1 (Congenital Heart Defects)

- Embryology, Fetal & Adult Circulation
- Introduction to CHD's & Classification
- Acyanotic CHD'S – ASD, VSD, PDA, PAPVC, Stenotic lesions – etiology, clinical presentation, diagnosis & management
- Cyanotic CHD'S – TOF, TGA, DORV, Endocardial cushions defects, TAPVC,Ebstein's Anomaly – etiology, clinical presentation, diagnosis & management
- Dextrocardia

Unit – 2 (Myocardial – Pericardial Diseases)

- Pericardial diseases: Introduction, types. Etiology, clinical presentation, diagnosis& management of pericardial effusion, tamponade, constrictive pericarditis, Constrictive vs Restrictive pathophysiology
- Myocardial diseases - Introduction, types, etiology, clinical presentation, diagnosis& management

Unit – 3 (Aortic Diseases)

- Introduction & Types
- Etiology, clinical presentation, diagnosis & management of aortic aneurysm, aortic dissection, RSOV, aortic trauma

Unit – 4 (Cardiac Masses & Tumors)

- Introduction, primary cardiac tumors, Metastatic cardiac tumors - etiology, clinical presentation, diagnosis & management

Unit – 5 (Medicine Relevant to CCT)

- Pulmonary Edema
- Hypertension, Diabetes Miletus

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- Hematology – Anaemia, bleeding disorders – impact on CVS
- COPD, ARDS – impact on cardiovascular system
- Renal System – AKI, CKD, Role of dialysis – impact on cardiovascular system

Practical Contents

Unit – 1 (Congenital Heart diseases)

- Clinical Examination, Physical Examination,Diagnosis & Management: clinical decision making, timing of surgery

Unit – 2 (Myocardial – Pericardial Diseases)

- Clinical Examination, Physical Examination,Diagnosis & Management: clinical decision making, timing of surgery

Unit – 3 (Aortic Diseases)

- Clinical Examination, Physical Examination, Diagnosis &Management: clinical decision making, timing of surgery

Unit -4 (Medicine Relevant to CVT)

- Diagnostic tests and interpretation of COPD, ARDS, Anemia, Bleeding disorders,AKI, CKD and its impact on Cardio Vascular System

5. Course Mapping

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

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3.Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		
2. Pathology Laboratory		32
3. Clinical Laboratory		
4. hospital	-	
5. Model Studio	-	
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	32
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
Total Duration in Hours		103

7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

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In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be twoassignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

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9. Course Resources

a. Essential Reading

- Leo Schamroth - Electrocardiography
- Cardiac Embryology: Indrabeer Singh
- Congenital Heart Diseases: 1) Myung Park, 2) J K Perloff 3) Moss and Adams
- Feigenbaum's Echocardiography – 7th or 8th edition,
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5th edition
- ASE Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim

b. Recommended Reading

- ECG Made Easy – Atul Luthra
- Echo Made Easy – Atul Luthra
- Class notes

c. Journals:

- Pubmed

d. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

10. Course Organization

Course Code	CCC301A	
Course Title	Cardiac Evaluations and Therapies- II	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Course Title	Applied Cardiac Care Technology- II
Course Code	CCC302A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

1. Course Summary

1. Aim and Summary

The aim of this course is to introduce students to non-invasive and invasive diagnostic tests used in the department of cardiology. The students are introduced to the concepts of electrocardiography, echocardiography and exposed to the applications of these modalities in diagnosing congenital and systemic heart diseases. The students are also exposed to interventional cardiology which help them in understanding the role of various interventional procedures in management of underlying conditions

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

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II. Teaching, Learning and Assessment

3. Course Outcomes (COs)

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

No.	Course Outcome
1.	Explain the concept of cardiac arrhythmias its types, mechanism and ECG features of various congenital and systemic heart diseases
2.	Describe 2D features and Doppler echocardiographic methods to assess various congenital heart diseases
3.	Describe 2D features and Doppler echocardiographic methods to assess various systemic heart diseases and significance of contrast echo
4.	Describe the role of various interventional procedures, pacemakers and defibrillators in management of disease states including congenital, systemic heart diseases and cardiac arrhythmias
5.	Demonstrate how to approach, perform and clinical importance of different echo views and various Doppler methods and its limitations in diagnosing congenital and systemic heart diseases
6.	Demonstrate patient preparation, equipment handling and materials to beused and role of cardiac technologist during various interventional procedures performed for underlying cardiac pathologies

4.Course Contents

Unit – 1 (Non – Invasive diagnostic Tests: ECG)

- ECG in Congenital Heart diseases: Acyanotic – ASD, VSD, PDA, Cyanotic –TOF,DORV, TGA, Endocardial cushion defects, Ebstein's Anomaly, Dextrocardia – True and Technical dextrocardia
- ECG in pericardial and myocardial diseases – Acute pericarditis, pericardialeffusion, tamponade and myocarditis
- ECG in aortic diseases – Aortic dissection, RSOV
- Cardiac Arrhythmias – introduction, mechanism, bradyarrhythmia's,tachyarrhythmias – types, mechanism, ECG criteria, Complications
- WPW syndrome
- Holter monitoring, Ambulatory BP monitoring, loop recorders
- Defibrillators

Unit – 2 ((Non – Invasive diagnostic Tests: ECHO)

- Echo in Congenital Heart defects: Introduction, Pediatric ECHO – Transducer selection, Basic echo views, Echo findings in Acyanotic and cyanotic congenitalheart defects, role of echo in risk stratification and timing of surgery
- Echo in Myocardial and Pericardial Diseases: Myocarditis, Pericardial effusion,Cardiac Tamponade, Constrictive Pericarditis, Constrictive vs Restrictive Pericarditis

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- Echo in aortic diseases: Aortic aneurysm, aortic dissection, RSOV, aortic trauma
- Echo in Pulmonary arterial hypertension and pulmonary embolism
- Echo in Cardiac masses and tumors
- Contrast Echo – Indications, contraindications, types, procedure and interpretation, role of contrast echo in ischemic, congenital and valvular heartdiseases
- Prosthetic Valves: Introduction, Types, evaluation of prosthetic valve function by echocardiography

Unit – 3 (Cardiac Cath and Intervention – II)

- Carotid, Cerebral and renal angiography
- Device Closures: Introduction, Types of devices. Indications, contraindications, materials used, procedure, complications & management of ASD, VSD, PDA, Coil Closure of PDA
- Valvuloplasties : PTMC, pulmonary and aortic valvuloplasty, LA appendage closure device
- Pacemakers: Basic concepts of pacemaker, Temporary and Permanent Pacemakers, Indications and Contraindications, Single chamber and dual chamber pacing, Bi-ventricularpacing, Pacemaker problems, Implantable Cardioverter Defibrillators
- Fractional Flow Reserve
- Rotabalator
- Cardiac Cath & Intervention in HOCM

Practicals Course Contents**Unit – 1 (ECG)**

- ECG in CHD's: Performing & interpretation of ECG and making diagnosis
- ECG in arrhythmias, WPW syndrome: Performing & interpretation of ECG andmaking diagnosis
- ECG in myocardial – Pericardial diseases and aortic diseases: Performing &interpretation of ECG and making diagnosis
- Holter monitoring, Ambulatory BP monitoring, Loop recorders – patientpreparation, interpretation, clinical significance
- Defibrillators

Unit – 2 (Echocardiography)

- ECHO in Congenital heart defects: views used, clinical applications of 2D & Doppler methods to diagnose and quantify severity, Technical factors in image optimization
- ECHO in myocardial – pericardial diseases: views used, clinical applications of 2D& Doppler methods to diagnose and quantify severity, Technical factors in image

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optimization

- ECHO in aortic diseases: views used, clinical applications of 2D & Doppler methods to diagnose and quantify severity, Technical factors in image optimization of Echo in PAH, Pulmonary Embolism, Cardiac tumors & masses
- Echocardiographic evaluation of prosthetic valve function

Unit – 3 (Cardiac Cath & Intervention III)

- Patient preparation, preparing for procedure, views, management of complications of Cerebral, carotid, renal angiography, Device closures, Valvuloplasties, Pacemakers & Defibrillators, FFR, Rotabalator, Septal myectomy

5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1							2			
CO-2	3	1	1		2				3	1		
CO-3	3	1	1		2				3	1		
CO-4	3	1	1		2				3	1		
CO-5	3	1	2	1	2	1	1	2	2	1		1
CO-6	3	2	2	1	2	1	1	2	3	1		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		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		32
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	

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Others		32
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
Total Duration in Hours		103

7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component aspart of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hourtheory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

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

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SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- A text book of Electrocardiography -Goldberger
- Leo Schamroth
- Feigenbaum's Echocardiography – 7th or 8th edition
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5th edition
- ASE's Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim

b. Recommended Reading

- ECG Made Easy – Atul Luthra
- Echo Made Easy – Atul Luthra
- Class notes

c. Journals:

- Pubmed

d. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

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10. Course Organization

Course Code	CCC302A	
Course Title	Applied Cardiac Care Technology – II	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Course Specifications: Project Management

Course Title	Project Management
Course Code	AHM305A
Department	Directorate of Transferable Skills and Leadership Development
Faculty / School	All Faculties / Schools of RUAS

1. Course Summary

Aim and Summary

With the advent of technology, changing business environments, varying economic conditions and prevailing political situations, a varied types of projects are being undertaken. This is seen in different segments such as infrastructure, construction, Information Technology, Manufacturing, Engineering, Health Care, Hospitality, Logistics and Services. Along with these, there is a big need for manpower with competencies in Managing different types and sizes of projects. A Project Management Professional equipped with,

- Appropriate tools and techniques,
- An ability to apply appropriate methods and processes
- Appropriate project leadership skills and
- A structured approach to manage a project in its entirety will be in a betterposition

to ensure a project's defined success.

The course aims at imparting knowledge and developing competencies on various aspects of Project Management as per International Project Management Association's framework. This course also provides a glimpse of tools, techniques, methods and process for managing a project effectively. This course offers a structured approach which are derived from the experiences of a large number of successful global organizations.

2. Course Size and Credits:

Number of credits	02
Total hours of teaching and learning activities during the semester	30
Number of practical/tutorial hours	30
Number of semester week(s)	15
Department responsible	Directorate of Transferable Skills and Leadership Development

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Course evaluation	Total Marks: 100
Pass requirement	40% (min) in Component 1 and 40% (min) in Component 2
Attendance requirement	As per the Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course Outcomes (COs)
1.	Explain the characteristics of projects, Operations and principles of Project Management
2.	Discuss the Project Management Competency Elements as per PMA's Individual CompetenceBaseline Ver 4.0
3.	Discuss the tools for Project Execution, Monitoring and control
4.	Apply the tools for project planning and Create a Project Management Plan covering ProjectCharter, Work Breakdown Structure, Project Organisation, Time Management Plan and RiskManagement Plan

3. Course Contents:

Section 1

Introduction to Project, Programmes, Portfolio and OperationsProject Organization and Permanent Organization

Project Management Success

- KRAs

Creation of project

- Need analysis
- Business Case
- Project Charter

Section 2

Requirements, Objectives & BenefitsScope

- WBS
- Scope baseline
- Change ManagementTime Management
- Lifecycle
- AOA (ADM)
- AON (PDM)
- CPM
- Floats
- Network Exercises

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- Gantt Charts
- Bar Charts Resources

Resource Calendar

Section 3

Controlling
Handling
Changes
Phase end and Close out
Earned Value Management System

- Variances, SPI & CPI
- Numerical

ExercisesQuality
Management

- Quality Planning
- Quality Assurance
- Quality Control
- Quality Tools
  - Pareto Chart
  - Control Chart
  - Inspections
  - Benchmarkin

gRisk & Opportunity

- Risk categories
- Identification
- Risk Analysis

Section 4

Organization and InformationStakeholder Management Power and Interest
Culture and Values
Personal integrity and reliabilityPersonal communication

- Communication Planning
- Communication methods
- Communication barriersConflict and crisis

Resourcefulness
Result Orientation

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5 .Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration inHours
Face to Face Lectures		20
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical		
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems		
PracticalWork		
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	05	
2. Guest Lecture		
3. Industry/Field Visit		25
4. Brain Storming Sessions		
5. Group Discussions	20	
6. Discussing Possible Innovations		
Written Examination (Term tests and SEE)		05
Total Duration in Hours		50

6. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test

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e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component aspart of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hourtheory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

7. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching andlearning methods

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Class room lectures
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions / Group Discussions
6.	Practical Skills	Case discussions
7.	Group Work	case study and group discussions
8.	Self-Learning	Seminars
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Seminars, Case discussions
12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions
15.	Leadership Skills	Group discussions

8. Course Resources

a. Essential Readings

- Course Notes

- Pinto Jeffrey K. (2019) Project Management: Achieving CompetitiveAdvantage, 5th Edition, Pearson

b. Recommended Readings

- Meredith, J.R. and Mantel, S.J. (2005) Project Management – a managerial approach, 6thedition, Wiley
- Ghattas, R. G. and Sandra L. Mckee (2001) Practical Project Management, New Jersey, Prentice Hall

c. Magazines and Journals

- Project Manager Today
- PM network
- International Journal of Project and Operation Research, Inderscience
- Journal of Operation Management, Project and Operation Research, INFORMS

d. Websites

- http://www.providence.edu/mcs/rbg/mba.htm
- http://library.kent.ac.uk/library/exampapers/deptcourses.php?dept=Business%20Studies
- http://homepages.stmartin.edu/fac_staff/dstout/MBA631/lecture_notes.htm

9. Course Organisation

Course Title		Project Management
Course Code		AHM305A
Course Leader/s Name		Mr. Jyothi Shankar G
Course Leader Contact Details	**Phone:**	080 – 4536 6666
	E- mail:	
Course Specifications Approval		
Next Course Specifications Review		

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Course Specifications: Directed Clinical Education 3

Course Title	Directed Clinical Education - 3
Course Code	CCC303A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

1. Course Summary

Aim and Summary

This course aims at imparting practical skills of performing and interpreting ECG, ECHOand how to overcome technical problems, maintenance and upkeep of equipment used in ECG, ECHO and cath lab. Students are oriented to how to approach patients and pretest requisites and will be taught how to assist, pre and post patient care during various interventional procedures.

2. Course Size and Credits

Number of credits	12
Total hours of class room interaction during the semester	00
Number of tutorial & Laboratory hours	360
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes (COs)

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

No.	Course Outcome
1.	Demonstrate how to perform physical examination which aids in diagnosing various cardiac pathologies
2.	Demonstrate how to interpret given ECG and diagnose various cardiac Pathologies

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3.	Demonstrate how to approach, perform and to know the importance of 2D and Doppler methods, their technical limitations in diagnosing the variouscardiac pathologies
4.	Prepare the patient and arrange the materials used in cathlab for various interventional procedures
5.	Demonstrate the clinical utility and post procedural care of eachinterventional procedure and measures to overcome associated complications during the procedures

4. Course Contents

ECG:

Performing and Interpretation of ECG of Congenital, Myo-pericardial diseases,Aortic diseases and Cardiac masses

ECHO:

Patient Preparation, Performing and application of various methods to diagnose Congenital, Myo-pericardial diseases, Aortic diseases and Cardiacmasses

Cardiac Cath & Intervention III

Patient preparation, equipment maintenance and prerequisites, assistance during procedure, management of complications of Cerebral, carotid, renal angiography, Device closures, Valvuloplasties, Pacemakers & Defibrillators, FFR, Rotabalator, Septal myectomy procedures

5. Course Mapping

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

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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 charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		360
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
Total Duration in Hours		360

7. Method of Assessment

SC1 (Internal Viva)	SC2 (Logbook)
50 Marks	50 Marks

In Option 2, there shall be two subcomponents, each carrying 5 marks. Online Test

After the two subcomponents are evaluated, the CE component marks are consolidated toattain 100% Weightage.

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8. Achieving learning outcomes

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

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- Leo Schamroth - Electrocardiography
- Cardiac Embryology: Indrabeer Singh
- Congenital Heart Diseases: 1) Myung Park, 2) J K Perloff 3) Moss and Adams
- Feigenbaum's Echocardiography – 7th or 8th edition,
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5th edition
- ASE Comprehensive Echocardiography

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- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim

b. Recommended Reading

- Log Book

c. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

10. Course Organization

Course Code	CCC303A	
Course Title	Directed Clinical Education -3	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

B.Sc. (Hons) in Cardiac Care Technology
2022-2026

SEMESTER -6

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Course specifications: Nuclear Cardiology

Course Title	Nuclear Cardiology
Course Code	CCC304A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

1. Course Summary

Aim and Summary

The aim of this course is to introduce students to the basic concepts of nuclear imaging. Students are oriented to the concepts of basic principles, equipment used, its working principle and also exposed to patient preparation, procedures of nuclear imaging and emphasize the role of nuclear imaging in assessment of cardiac diseases.

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes (COs)

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

No.	Course Outcome
1.	Describe the basic principles and clinical importance of nuclear imaging in the field of cardiology
2.	Explain equipment used, its working principle, procedure of MPI and clinical importance of myocardial viability for risk stratification
3.	Explain equipment used, its working principle, procedure and clinical importance of PET & SPECT in diagnosing coronary artery disease
4.	Explain equipment used, its working principle, procedure and clinical importance of cardiac MRI in diagnosing various cardiac diseases

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5.	Demonstrate how to approach, patient preparation and equipment maintenance and clinical importance of myocardial perfusion imaging
6.	Demonstrate how to approach, patient preparation and equipment maintenance and clinical importance of cardiac MRI in diagnosing cardiacpathologies

4. Course Contents

Unit – 1

- Introduction
- Physiology, Quantification of function

Unit – 2 (Conventional Nuclear Medicine)

- Basic Principle, Equipment Used
- Indications, Contraindications, Procedures
- Role of MPI in diagnosing and Assessing severity of CAD

Unit – 3(PET & SPECT Scan)

- Basic Principle, Equipment Used, Radiotracers used
- Indications, Contraindications, Procedure – Protocols, Technical artifacts
- Interpretation, Limitations
- MUGA Scan

Unit – 4 (CT & MRI)

- Basic Principle, Equipment Used & its working principle
- Indications, Contraindications, Procedures, Limitations
- Role of CT & MRI in assessment of various cardiac diseases

Practicals

- Instrumentation – Working principle and maintenance
- Patient preparation and protocols used, Interpretation, Record maintenance
- Clinical importance of MPI and CT & MRI imaging in assessing various cardiac pathologie

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5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1							2			
CO-2	3	1							2			
CO-3	3	1							2			
CO-4	3	1							2			
CO-5	3	1	1	1	1			1	3			1
CO-6	3	1	1	1	1			1	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		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		
2. Pathology Laboratory		32
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	32
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
Total Duration in Hours		103

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7. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be twoassignments and two term-tests. The assignments can be of any of the following types:

a. Online Test
b. Problem Solving
c. Field Assignment
d. Open Book Test
e. Portfolio
f. Reports
g. Case Study
h. Group Task
i. Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the followingteaching andlearning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment

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9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- Mettler
- Gopal B Saha

b. Recommended Reading

- Class notes

c. Journals.

d. Pubmed

10. Course Organization

Course Code	CCC304A	
Course Title	Nuclear cardiology	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Course specifications: Advanced cardiac care technology

Course Title	Advanced cardiac care technology
Course Code	CCC305A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

1. Course Summary

Aim and Summary

The aim of this course is to introduce students to the newer advanced modalities used in the field of cardiology. The students are oriented to the basic principles, equipment used and also exposed to the clinical application of advanced modalities and emphasized their role in diagnosing various cardiac pathologies

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

2. Teaching, Learning and Assessment

Course Outcomes (COs)

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

No.	Course Outcome
1.	Describe basic concepts, equipment used, working principle, procedure and interpretation of newer modalities used in electrocardiography
2.	Describe basic concepts, equipment used, working principle, procedure and interpretation of newer imaging techniques used in echocardiography
3.	Explain clinical importance of Trans esophageal echo, TDI, Strain imaging, Intracardiac Echo in diagnosing various cardiac pathologies

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4.	Describe basic concepts, equipment used, working principle, clinical importance of newer interventional procedures
5.	Demonstrate how to approach, patient preparation, maintenance of equipment protocols used, interpretation and post procedure care of special procedures used in echocardiography
6.	Demonstrate how to approach, patient preparation, maintenance of equipment protocols used, interpretation and post procedure care of newer interventional procedures and their diagnostic utility

3. Course Contents

Unit – 1: (Non – Invasive Diagnostics – ECG)

- Newer technologies for monitoring the patients with heart diseases

Unit – 2: (Non – Invasive Diagnostics – ECHO)

- Trans esophageal Echocardiography: Introduction, indications & contraindications, Transducer – position, orientation and manipulation, TEE probe – Types, views, Role of TEE in various cardiac diseases
- Tissue Doppler Imaging & Strain Imaging: Principles, Advantages, Disadvantages, Role of TDI & Strain imaging in diagnosis of various cardiac diseases
- Intracardiac Echocardiography: Instrumentation & Technique, Applications &Limitations
- Storage and retrieval of echo images
- Newer types of ultrasound scanners: Portable, Laptop, Handheld, Palm held, Point of care echoes
- Cardiac Dyssynchrony

Unit – 3 (Cardiac Cath & Intervention IV)

- IVC filter
- Cardiac resynchronization therapy
- EP Study: Introduction, Indications & Contraindications, Materials used, procedure& complications
- IVUS
- Cardiac assist devices: Indications, Procedure, Materials used, Complications of: IABP, Impella, LVAD, ECMO
- Recent advances in interventional cardiology: Procedure, Materials used, Complications of TAVI, Mitra clips and role of echo in these procedures

Practical Course Contents: Unit – 1 (ECHO)

- TEE – Demonstration of patient preparation, equipment used, procedure, identification of cardiac structures, views and interpretation of diagnosis
- 3D Echo - Demonstration of equipment used, views, identification of cardiac structures and

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interpretation

- TDI & Strain Imaging: steps to acquire & perform, analysis and clinical significance
- Role of Intra cardiac Echo
- Recording, storage and retrieval of Echo images

Unit – 2 (Cardiac Cath & Intervention IV)

- Demonstration and role of newer advanced techniques in diagnosing and treating cardiac diseases – IVC filter, CRT, Cardiac assist devices, EP study, TAVI & Mitra clips

4. Course Mapping

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

5. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		

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1. Case Study Presentation		32
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
Total Duration in Hours		103

6. Method of Assessment

CE (60% weightage)			SEE (40% weightage)	
SC1 (Term Tests) 30%	SC2 (Innovative+ Lab assignment) 10%	SC3 (Written+ Lab assignment) 20%	SEE (Theory) 30%	SEE(Lab) 10%

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be twoassignments and two term-tests. The assignments can be of any of the following types:

a) Online Test
b) Problem Solving
c) Field Assignment
d) Open Book Test
e) Portfolio
f) Reports
g) Case Study
h) Group Task
i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part ofCE will have external examiner evaluation and marks listed separately for industry requirements.For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

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Bengaluru 560054

7. Achieving learning outcomes

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

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

8. Course Resources

a. Essential Reading

- A text book of Electrocardiography -Goldberger
- Leo Schamroth
- Feigenbaum's Echocardiography – 7th or 8th edition
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5thedition
- ASE Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W.
- Grossman's D.Baim

b. Recommended Reading

- Class notes

c. Journals:

- Pubmed

d. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

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9. Course Organization

Course Code	CCC305A	
Course Title	Advanced Cardiac Care Technology	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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Bangalore 560054

Course specifications: Directed clinical education- 4

Course Title	Directed clinical education - 4
Course Code	CCC307A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

1. Course Summary

Aim and Summary

This course aims at imparting practical skills of performing newer imaging techniques and how to overcome technical problems and to impart knowledge in maintenance and upkeep of equipment used in ECG, ECHO and Cathlab. Students are oriented to the importance of newer techniques in patient care.

2. Course Size and Credits

Number of credits	12
Total hours of class room interaction during the semester	00
Number of tutorial & Laboratory hours	360
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes (COs)

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

No.	Course Outcome
1.	Outline clinical importance of newer modalities in field of cardiology
2.	Demonstrate how to prepare, materials used, procedure and interpretation and post procedural care during Transesophageal echo
3.	Demonstrate indications, how to perform and to know the importance of tissue Doppler and strain imaging & their technical limitations in diagnosing the various cardiac pathologies

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4.	Prepare the patient and arrange the materials used in cathlab for various interventional procedures
5.	Impart knowledge of the clinical importance of newer interventional procedures over cardiac surgeries

4. Course Contents

Unit – 1 (ECHO)

- TEE – Demonstration of patient preparation, equipment used, procedure, identification of cardiac structures, views and interpretation of diagnosis
- 3D Echo - Demonstration of equipment used, views, identification of cardiac structures and interpretation
- TDI & Strain Imaging: steps to acquire & perform, analysis and clinical significance
- Role of Intracardiac Echo
- Recording, storage and retrieval of Echo images

Unit – 2 (Cardiac Cath & Intervention IV)

- Demonstration and role of newer advanced techniques in diagnosing andtreating cardiac diseases – IVC filter, CRT, Cardiac assist devices, EP study, TAVI & Mitra clips

5 Course Mapping

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

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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 charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		
2. Pathology Laboratory		360
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
Total Duration in Hours		360

7. Method of Assessment

SC1 (Internal Viva)	SC2 (Logbook)
50 Marks	50 Marks

In Option 2, there shall be two subcomponents, each carrying 5 marks. Online Test

After the two subcomponents are evaluated, the CE component marks are consolidated to attain 100%Weightage.

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8. Achieving learning outcomes

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

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semesterexams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practicals
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- Leo Schamroth - Electrocardiography
- Feigenbaum's Echocardiography – 7th or 8th edition,
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5thedition
- ASE Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W.
- Grossman's D.Baim

b. Recommended Reading

- Log Book

c. Websites:

- https://www.onlinejase.com/
- https://academic.oup.com/ehjcimaging

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10. Course Organization

Course Code	CCC307A		
Course Title	Directed Clinical Education -4		
Course Leader's Name		As per time table	
Course Leader Contact Details		Phone:	
		E-mail:	
Course Specifications Approval Date			
Next Course Specifications Review			

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

B.Sc. (Hons) in Cardiac Care Technology
2022-2026

SEMESTER -7

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Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2026

Course specifications: Research Project

Course Title	Research Project
Course Code	CCP401A
Department	Allied Health Science
Faculty	Life And Allied Health Science

1. Course Summary

Aim and Summary

The aim of this course is to give students an experience of addressing a real time problemin cardiac care tech.

The students are expected to work in a team of not more than 4 members and are required to develop an appropriate solution by identifying a problem for which a better or new solution is required. The team need to propose a solution / develop a physical product and write a project report.

2. Course Size and Credits.

Number of credits	10
Total hours of class room interaction during the semester	290
Total number of team members	5
Number of semester weeks	29
Department responsible	Allied Health Science
Course marks	100
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes (Cos)

After undergoing this course students will be able to:

No.	Course Outcomes
1	Refine the problem in Allied Health Science
2	Identify appropriate methodology to solve the problem
3	Propose solutions to the problem identified
4	Prepare a project report as per the specified guidelines

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5	Presentation of the research finding in an appropriate forum

4. Course Contents

Course Content
Identifying a problem for which a better or new solution is required, through literature review or as defined by Biotechnology experts from Industry
Defining the scope of the problem followed by aim and objectives
Identifying the methodology to meet the objectives
Data collection, analysis and interpretation
Propose solution based on data analysis and interpretation (Can be a physical product as well)
Preparing/ writing a project report and presentation in appropriate forum

5. Course Teaching and Learning Methods

	Teaching and Learning Methods	**Duration in hours**
1.	Refining Problem, Aim, Objective & Methodology in oncurrence with academic guide	02
2.	Review Plan, design and execution of experiments	20
3.	Data collection, Analysis and Interpretation	20
4.	Discussion with supervisor	06
5.	Propose solution	10
6.	Report presentation	02
Total Duration in Hours		60

6. Method of Assessment

Project component CE	SEE
SC1 (protocol presentation, datacollection, Analysis)	SEE
(20+20+20)	40 (Thesis presentation)

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7. Achieving Learning Outcomes

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

Sl. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Project Work
2.	Understanding	Project Work\ Interaction with Supervisor
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	Project Report
10.	Verbal Communication Skills	Examination, Viva-Voce
11.	Presentation Skills	Presentation, Viva-Voce
12.	Behavioral Skills	Project Work
13.	Information Management	Project Report
14.	Personal Management	Project Work
15.	Leadership Skills	

8. Course Resources

a. Essential Reading

1. Gurumani, N., 2006, Research methodology for biological sciences, MJP Publishers.

b. Recommended Reading

1. Gurumani, N., 2010, *Scientific Thesis Writing And Paper Presentation*, 1st Edition, MJP Publishers.

c. Magazines and Journals: -

d. Websites

1. https://www.ncbi.nlm.nih.gov/pubmed
2. https://www.sciencedirect.com/
3. https://www.biomedcentral.com/

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4. http://www.nature.com/
5. https://www.cell.com/

e. Other Electronic Resources

1. Journals related to the respective topics of research

9. Course Organization

Course Code	CCP401A		
Course Title	RESEARCH PROJECT		
Course Leader/Name		As per timetable	
Course Leader Contact Details		Phone:	080-45366666
		E-mail:	
Course Specifications Approval Date			
Next Course Specifications Review Date:			

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Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2026

Course specifications: Internship

Course Title	Internship
Course Code	CCI401A
Department	Allied Health Sciences
Faculty	Life and Allied health Sciences

1. Course Summary

Aim and Summary

This internship training deals with postings in various specialty units of the Cardiology department. The students are trained to acquire skills for the actual conduct of all the clinical services entrusted to them in the specialty units leading to the emergence of trained cardiac care technology.

2. Course Size and Credits:

Number of credits	11
Total hours of internship in an academicsemester	638
Number of tutorial hours	NIL
Number of weeks per semester	29
Department responsible	Allied Health Sciences
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

3. Teaching, Learning an Assessment

Course Outcomes (Cos)

After undergoing this internship, student will be able to:

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No.	Course Outcomes
1	Describe the anatomy of heart, cardiac position , cardiac circulation
2	Discuss techniques of ECG recording, axis duration, and various rhythms
3	Explain principle of 2D imaging and echo views , basic principle of cath lab, radiation safety, vascular access, angiogram , device closure and its management
4	Diagnose and evaluate acute coronary syndrome , HF , arrhythimia and its management, cardiac emergency drugs and its uses
5	Evaluate Ischemic Heart disease, valvular Heart Disease, cardiomyopathy and other cardiac diseases
6	Describe clinical features of valvular Heart Disease and its complication

4. Course Contents

Internship:

(1) Internship is a phase of training where in a student is expected to conduct actual practice and acquires skills under supervision so that he or she may become capableof functioning independently.
(2) Intern will rotate in the following areas for the duration mentioned in the followingtable.

Sl. No.	Postings	Durationin weeks
1	ECHO	10
2	ECG	1
3	TMT	1
4	HOLTER MONITRING	1
5	DSE/TEE	2
6	CCU	2
7	CATHLAB	4
8	WARDS	1

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Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2026

Practicals: Non invasive Technology;ECG recording basic ECHO evaluation basic Preparation for treadmill test Preparation for 24 hours Holter monitoringPreparation for ABPM Invasive Technology; Cardiac Cath right Heart Cardiac Cath Left Heart Cardiovascular AngiographyCardiac Pacing Relevant instrumentation in Cath LabCardiac Emergencies in Cath Lab
History taking Clinical Examination: General Physical Examination and assessment of vital signsClinical Examination: Basic Systemic Examination Conversion between differentunits Identifying the types of medical gas supply and its advantages/disadvantagesDevices: Sphygmomanometer, thermometer, pulse oximeter, simpleoxygen delivery devices. Diagnosis of shunts Evaluation of pulmonary hypertension Diagnosis of pericardial constriction Diagnosis of peripheral and aortic diseases Complications of cardiac catheterization Complications and management of Contrast

5. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in Hours
Face to Face Lectures		
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy or Tutorials		
1. Solving Numerical Problems		

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Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2026

Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital	X	638
6. Model Studio		
Others		
1. Case Study Presentation	X	
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Total Duration in Hours		638

6. Method of Assessment

Laboratory components CE	**SEE**
SC1(Formative laboratory performance assessment/logbook)	SEE
60 Marks	40(OSPE/OSCE)

7. Achieving Learning Outcomes

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

Sl No	**Curriculum and Capabilities**	**How imparted during the course**
1.	Knowledge	
2.	Understanding	Clinical postings
3.	Critical Skills	Clinical postings
4.	Analytical Skills	Clinical postings
5.	Problem Solving Skills	Clinical postings
6.	Practical Skills	Clinical postings
7.	Group Work	Clinical postings
8.	Self-Learning	Clinical postings

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Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2026

9.	Written Communication Skills	Patient orders
10.	Verbal Communication Skills	Clinical postings
11.	Presentation Skills	
12.	Behavioral Skills	Clinical postings
13.	Information Management	
14.	Personal Management	Clinical postings
15.	Leadership Skills	Clinical postings

8. Course Resources

a. Essential Reading:

- Class notes
- A Text book of Electrocardiography - Goldberger.
- Nanda's A Text book of Echocardiography.
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim

b. Recommended Reading:

- A Text book of Electrocardiography - Goldberger. 2 Nanda's A Text book of Echocardiography.
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim.
- A Text book of Cardiovascular Medicine. Dr. Bruanwald's.
- A Text book of Medicine. Davidsons.

9. Organization

Course Code	19CCT402A	
Course Title	INTERNSHIP	
Course Teacher/Name	As per the time table	
Course Teacher Contact Details	Phone:	080-45366666
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review Date		

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B.Sc. (Hons) in Cardiac Care Technology
2022-2026

SEMESTER -8

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Course specifications: Research Project

Course Title	RESEARCH PROJECT
Course Code	CCP402A
Department	Allied Health Science
Faculty	Life And Allied Health Science

1. Course Summary

Aim and Summary

The aim of this course is to give students an experience of addressing a real time problemin cardiac care tech.The students are expected to work in a team of not more than 4 members and are required to develop an appropriate solution by identifying a problem for which a better or new solution is required. The team need to propose a solution / develop a physical product and write a project report.

2. Course Size and Credits:

Number of credits	10
Total hours of class room interactionduring the semester	290
Total number of team members	5
Number of semester weeks	29
Department responsible	Allied Health Science
Course marks	100
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes (COs)

After undergoing this course students will be able to:

No.	Course Outcome
1.	Refine the problem in Allied Health Science
2.	Identify appropriate methodology to solve the problem
3.	Propose solutions to the problem identified
4.	Prepare a project report as per the specified guidelines
5.	Presentation of the research finding in an appropriate forum

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4. Course Contents

Course Content
Identifying a problem for which a better or new solution is required, through literature review or as defined by Biotechnology experts from Industry
Defining the scope of the problem followed by aim and objectives
Identifying the methodology to meet the objectives
Data collection, analysis and interpretation
Propose solution based on data analysis and interpretation (Can be a physical product as well)
Preparing/ writing a project report and presentation in appropriate forum

5. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in hours
7.	Refining Problem, Aim, Objective & Methodology in oncurrence with academic guide	02
8.	Review Plan, design and execution of experiments	20
9.	Data collection, Analysis and Interpretation	20
10.	Discussion with supervisor	06
11.	Propose solution	10
12.	Report presentation	02
Total Duration in Hours		60

6. Achieving learning outcomes

Project component CE	SEE
SC1 (protocol presentation, data collection, Analysis)	SEE
(20+20+20)	40 (Thesis presentation)

7. Achieving Learning Outcomes

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

Sl. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Project Work
2.	Understanding	Project Work\ Interaction with Supervisor
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	Project Report
10.	Verbal Communication Skills	Examination, Viva-Voce
11.	Presentation Skills	Presentation, Viva-Voce
12.	Behavioral Skills	Project Work
13.	Information Management	Project Report
14.	Personal Management	Project Work
15.	Leadership Skills	

8. Course Resources

a. Essential Reading

- Gurumani, N., 2006, Research methodology for biological sciences, MJP Publishers.

b. Recommended Reading

- Gurumani, N., 2010, Scientific Thesis Writing And Paper Presentation, 1st Edition, MJP Publishers.

c. Magazines and Journals

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Bangalore 560054

d. Websites

- https://www.ncbi.nlm.nih.gov/pubmed
- https://www.sciencedirect.com/
- https://www.biomedcentral.com/
- http://www.nature.com/
- https://www.cell.com/

e. Other Electronic Resources

- Journals related to the respective topics of research

9. Course Organization

Course Code	CCP402A	
Course Title	RESEARCH PROJECT	
Course Leader/Name	As per timetable	
Course Leader Contact Details	Phone:	080-45366666
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review Date:		

Head
Department of Allied Health Sciences
M S Ramaiah University of Applied Sciences
Bangalore 560054

Course specifications: Internship

Course Title	Internship
Course Code	CCI402A
Department	Allied Health Sciences
Faculty	Life and Allied health Sciences

1. Course Summary

Aim and Summary

This internship training deals with postings in various specialty units of the Cardiology department. The students are trained to acquire skills for the actual conduct of all the clinical services entrusted to them in the specialty units leading to the emergence of trained cardiac care technology.

2. Course Size and Credits

Number of credits	11
Total hours of internship in an academic semester	638
Number of tutorial hours	NIL
Number of weeks per semester	29
Department responsible	Allied Health Sciences
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

3. Teaching, Learning and Assessment

Course Outcomes (COs)

After undergoing this internship, student will be able to:

No.	Course Outcomes

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1	Describe the anatomy of heart, cardiac position , cardiac circulation
2	Discuss techniques of ECG recording, axis duration, and various rhythms
3	Explain principle of 2D imaging and echo views , basic principle of cath lab,radiation safety, vascular access, angiogram , device closure and its management
4	Diagnose and evaluate acute coronary syndrome, HF , arrhythimia and its management, cardiac emergency drugs and its uses.
5	Evaluate Ischemic Heart disease, valvular Heart Disease, cardiomyopathy and other cardiac diseases
6	Describe clinical features of valvular Heart Disease and its complication

4. Course Contents

Internship:

Internship is a phase of training where in a student is expected to conduct actual practice and acquires skills under supervision so that he or she may become capable of functioning independently.

Intern will rotate in the following areas for the duration mentioned in the following table.

Sl. No.	Postings	Durationin weeks
1	ECHO	10
2	ECG	1
3	TMT	1
4	HOLTER MONITRING	1
5	DSE/TEE	2
6	CCU	2
7	CATHLAB	4
8	WARDS	1

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Practicals:

- Non invasive Technology; ECG recording basic ECHO evaluation basic
- Preparation for treadmill test
- Preparation for 24 hours Holter monitoring Preparation for ABPM
- Invasive Technology; Cardiac Cath right Heart Cardiac Cath Left Heart Cardiovascular Angiography Cardiac Pacing
- Relevant instrumentation in Cath Lab Cardiac Emergencies in Cath Lab

History taking

- Clinical Examination: General Physical Examination and assessment of vital signs Clinical Examination: Basic Systemic Examination
- Conversion between different units
- Identifying the types of medical gas supply and its advantages/disadvantages
- Devices: Sphygmomanometer, thermometer, pulse oximeter, simple oxygen delivery devices.
- Diagnosis of shunts
- Evaluation of pulmonary hypertension Diagnosis of pericardial constriction Diagnosis of peripheral and aortic diseases Complications of cardiac catheterization Complications and management of Contrast

5. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in Hours
Face to Face Lectures		
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
Numeracy or Tutorials		
1. Solving Numerical Problems		
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital	X	638
6. Model Studio		
Others		

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1. Case Study Presentation	X	
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Total Duration in Hours		638

6. Method of Assessment

Laboratory components CE	**SEE**
SC1(Formative laboratory performance assessment/logbook)	SEE
60 Marks	40(OSPE/OSCE)

7. Achieving learning outcomes

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

Sl No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	
2.	Understanding	Clinical postings
3.	Critical Skills	Clinical postings
4.	Analytical Skills	Clinical postings
5.	Problem Solving Skills	Clinical postings
6.	Practical Skills	Clinical postings
7.	Group Work	Clinical postings
8.	Self-Learning	Clinical postings
9.	Written Communication Skills	Patient orders
10.	Verbal Communication Skills	Clinical postings
11.	Presentation Skills	
12.	Behavioural Skills	Clinical postings
13.	Information Management	

14.	Personal Management	Clinical postings
15.	Leadership Skills	Clinical postings

8. Course Resources

- Essential Reading
  - Class notes
  - A Text book of Electrocardiography - Goldberger.
  - Nanda's A Text book of Echocardiography.
  - A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim

- Recommended Reading:

  - A Text book of Electrocardiography - Goldberger. 2 Nanda's A Text book of Echocardiography.
  - A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim.
  - A Text book of Cardiovascular Medicine. Dr. Bruanwald's.
  - A Text book of Medicine. Davidsons.

9. Course Organization

Course Code	CCP402A	
Course Title	INTERNSHIP	
Course Teacher/Name	As per the time table	
Course Teacher Contact Details	Phone:	080-45366666
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review Date		

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