RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Programme Structure and Course Details

B. Tech. in Civil Engineering

2022-26

Faculty of Engineering and Technology

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RAMAIAH UNIVERSITY OF APPLIED SCIENCES

Programme Specifications

B. Tech. (Civil Engineering)

Degree Programme

Programme Code: 001

Faculty of Engineering and Technology

Batch 2022-2026

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Bangalore

Programme Specifications: B. Tech. (Civil Engineering)

Faculty	Engineering and Technology
Department	Civil Engineering
Programme Code	001
Programme Name	B.Tech. (Civil Engineering)
Dean of the Faculty	Dr. Dilip Kumar Mahanty
Head of the Department	Dr. Nayana N. Patil

1. **Title of the Award:** B.Tech. (Civil Engineering)
2. **Mode of Study:** Full-Time
3. **Awarding Institution /Body:** M. S. Ramaiah University of Applied Sciences, Bengaluru
4. **Joint Award:** Not Applicable
5. **Teaching Institution:** Faculty of Engineering and Technology, M. S. Ramaiah University of Applied Sciences, Bengaluru
6. **Date of Programme Specifications:** June 2022
7. **Date of Programme Approval by the Academic Council of MSRUAS:** 14 July 2022
8. **Next Review Date:** June 2026
9. **Programme Approving Regulating Body and Date of Approval:** All India Council for Technical Education, New Delhi, 30-Jun-2020
10. **Programme Accredited Body and Date of Accreditation:** Not Applicable
11. **Grade Awarded by the Accreditation Body:** Not Applicable
12. **Programme Accreditation Validity:** Not Applicable
13. **Programme Benchmark:** Not Applicable
14. **Rationale for the Programme**

Civil Engineering is primarily infrastructure development involving planning, design, construction, and operation of facilities essential to modern life, ranging from transit systems to offshore structures to space satellites. Major disciplines within Civil Engineering that are closely interrelated are Structural, Environmental, Geotechnical, Water Resources, Transportation, Construction and Urban planning.

Until recently Civil Engineering teaching was limited to planning, analysis, design and execution of different types of infrastructure like buildings, roads, bridges, dams and power plants. However, increasing technological sophistication and demand for higher living standards fuelled by economic growth and concerns about environmental impact have changed the scope of Civil Engineering curriculum. The challenges of today's Civil Engineering infrastructure are much more complex including reducing carbon emission and interdependencies between resources.

Even though there are a large number of institutions world over which are producing Civil Engineers, there is a shortage of quality Civil Engineering graduates. The FET at RUAS would like to offer Civil Engineering programme to produce imaginative, creative and innovative Civil

Engineers who are effective and efficient problem solvers providing economical and sustainable infrastructural solutions.

15. Programme Mission

The purpose of the programme is creation of innovative problem solvers in multi-disciplinary settings, entrepreneurs and leaders applying the knowledge, understanding, cognitive abilities, practical skills and transferrable skills gained through systematic, flexible and rigorous learning in the chosen academic domain.

16. Graduate Attributes (GAs)

GA-1. Engineering knowledge: Ability to apply knowledge of mathematics, science, and Engineering fundamentals to solve complex problems in engineering

GA-2. Problem Analysis: Ability to analyse engineering problems, interpret data and arrive at meaningful conclusions involving mathematical inferences

GA-3. Design and Development of Solutions: Ability to design an engineering system, component, or process to meet desired needs considering public health and safety, and the cultural, societal, and environmental considerations

GA-4. Conduct Instigations of Complex Problems: Ability to understand and solve complex engineering problems by conducting experimental investigations

GA-5. Modern Tool Usage: Ability to apply appropriate tools and techniques and understand utilization of resources appropriately to complex engineering activities

GA-6. The Engineer and Society: Ability to understand the effect of engineering solutions on legal, cultural, social, and public health and safety aspects

GA-7. Environment and Sustainability: Ability to develop sustainable solutions and understand their effect on society and environment

GA-8. Ethics: Ability to apply ethical principles to engineering practices and professional responsibilities

GA-9. Individual and Teamwork: Ability to work as a member of a team, to plan and to integrate knowledge of various engineering disciplines and to lead teams in multidisciplinary settings

GA-10. Communication: Ability to make effective oral presentations and communicate technical ideas to a broad audience using written and oral means

GA-11. Project Management and Finance: Ability to lead and manage multidisciplinary teams by applying engineering and management principles

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

17. Programme Outcomes (POs)

B.Tech. graduates will be able to:

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PO-1. Apply knowledge of mathematics, science, basic engineering fundamentals and engineering specialization concerned for the solution of complex engineering problems

PO-2. Identify, formulate and analyze engineering problems using first principles of mathematics, science and engineering to interpret data and reach substantiated conclusions

PO-3. Provide solutions to engineering problems by designing systems, components or processes to meet the specified needs considering public health, safety, societal and the environmental considerations

PO-4. Apply the knowledge of laboratory techniques and research methods to solve complex engineering problems through experimental investigations, analysis and interpretation of results

PO-5. Gain proficiency in modelling complex engineering activities by selecting appropriate techniques and IT Tools and utilize available resources effectively

PO-6. Understand the effect of engineering solutions on legal, cultural, social, public health and safety aspects and the consequent responsibilities

PO-7. Develop sustainable engineering solutions and assess their effect on society and environment

PO-8. Understand and apply ethical principles to engineering practices and professional responsibilities

PO-9. Function effectively as an individual or a team player to handle diverse problems in multi-disciplinary settings

PO-10. Make oral and written presentations to communicate technical ideas effectively to engineering community and society at large

PO-11. Apply the knowledge of engineering and management principles to manage projects in multi-disciplinary environments with consideration to cost and time

PO-12. Recognize and engage in lifelong learning to adapt to changing needs and advancements in technology

18. Programme Goal

The programme goal is to produce graduates having critical, analytical and problem-solving skills, and ability to think independently, and to pursue a career in Civil Engineering.

19. Program Educational Objectives (PEOs)

The Programme educational objectives of the B.Tech. (Civil Engineering) Programme are:

PEO-1. To provide students with knowledge in mathematics, science and core engineering area to enable them to deliver efficient solutions for complex engineering problems using analytical and cognitive skills

PEO-2. To enable students to design and develop the sustainable innovative solutions for industry and societal requirements by conducting engineering investigations through experimentation and usage of modern tools.

PEO-3. To inculcate ethics, communication, leadership, soft, managerial and entrepreneurial skills for successful career in industries and to engage in lifelong learning

20. Programme Specific Outcomes (PSOs)

At the end of the B.Tech.(Civil Engineering) program, the graduate will be able to:

PSO-1. Apply the knowledge of Civil engineering Analysis and Design in to develop efficient solutions for complex problems in Civil engineering and allied areas using analytical and cognitive skills.

PSO-2. Design and develop sustainable solutions using Civil engineering principles, concepts, experimentation and appropriate tools to address industry and societal requirements

PSO-3. Demonstrate ethics, leadership qualities, communication, entrepreneurial skills and involvement in lifelong learning for the betterment of organization, environment and society

21. Programme Structure:

Semester 1 (Physics Cycle)							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	MTB101A	Engineering Mathematics-1	3	1	0	4	100
2	PYB102A	Engineering Physics and Laboratory	3	0	2	4	100
3	CEF101A	Engineering Mechanics	3	0	0	3	100
4	ECF102A	Elements of Electronics Engineering and Laboratory	3	0	2	4	100
5	MEF103A	Engineering Drawing	2	0	2	3	100
6	LAN101A	Constitution, Human Rights and Law	2	0	0	2	50
		Total	**16**	**1**	**6**	**20**	**550**
Total number of contact hours per week			**23**				

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Semester 1 (Chemistry Cycle)							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	MTB101A	Engineering Mathematics - 1	3	1	0	4	100
2	CYB104A	Engineering Chemistry and Laboratory	3	0	2	4	100
3	MEF104A	Elements of Mechanical Engineering and Workshop Practice	2	0	2	3	100
4	EEF105A	Elements of Electrical Engineering and Laboratory	3	0	2	4	100
5	CSF106A	Elements of Computer Science and Engineering and Laboratory	3	0	2	4	100
6	TSN102A	Professional Communication	2	0	0	2	50
		Total	**16**	**1**	**8**	**21**	**550**
		Total number of contact hours per week	**25**				

Semester 2 (Physics Cycle)							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	MTB102A	Engineering Mathematics-2	3	1	0	4	100
2	PYB102A	Engineering Physics and Laboratory	3	0	2	4	100
3	CEF101A	Engineering Mechanics	3	0	0	3	100
4	ECF102A	Elements of Electronics Engineering and Laboratory	3	0	2	4	100
5	MEF103A	Engineering Drawing	2	0	2	3	100
6	LAN101A	Constitution, Human Rights and Law	2	0	0	2	50
		Total	**16**	**1**	**6**	**20**	**550**
		Total number of contact hours per week	**23**				

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Semester 2 (Chemistry Cycle)							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	MTB102A	Engineering Mathematics - 2	3	1	0	4	100
2	CYB104A	Engineering Chemistry and Laboratory	3	0	2	4	100
3	MEF104A	Elements of Mechanical Engineering and Work shop Practice	2	0	2	3	100
4	EEF105A	Elements of Electrical Engineering and Laboratory	3	0	2	4	100
5	CSF106A	Elements of Computer Science and Engineering and Laboratory	3	0	2	4	100
6	TSN102A	Professional Communication	2	0	0	2	50
		Total	**16**	**1**	**8**	**21**	**550**
		Total number of contact hours per week	**25**				

Semester 3							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	MTF201A	Engineering Mathematics -3	3	1	0	4	100
2	CEC202A	Mechanics of Solids	2	2	0	4	100
3	CEC203A	Mechanics of Fluids	2	2	0	4	100
4	CEC204A	Engineering Survey	3	1	0	4	100
5	CEC205A	Engineering Geology and Properties of Soils	3	0	0	3	100
6	CEC206A	Building Materials, Concrete and Construction Technology	3	0	0	3	100
7	CEL207A	Material Testing Laboratory	0	0	2	1	50
8	CEL208A	Survey Practice	0	0	2	1	50
9	CEL209A	Applied Engineering Geology Laboratory	0	0	2	1	50
10	BTN101A	Environmental Studies	2	0	0	2	50
		Total	**18**	**06**	**06**	**27**	**800**
		Total number of contact hours per week	**30**				

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Semester 4							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	MTF202A	Engineering Mathematics - 4	3	1	0	4	100
2	CEC212A	Transportation Engineering - 1	3	0	0	3	100
3	CEC213A	Structural Analysis - 1	2	2	0	4	100
4	CEC214A	Hydraulics and Hydraulic Machines	3	0	0	3	100
5	CEC215A	Environmental Engineering	3	0	0	3	100
6	CEC216A	Building Planning and Computer Aided Drafting	1	0	4	3	100
7	CEL217A	Hydraulics and Hydraulic Machines Laboratory	0	0	2	1	50
8	CEL218A	Environmental Engineering Laboratory	0	0	2	1	50
9	CEL219A	Concrete and Highway Materials Laboratory	0	0	2	1	50
10	BAU201A	Innovation and Entrepreneurship	1	1	2	3	100
		Total	**16**	**04**	**12**	**26**	**850**
		Total number of contact hours per week	**32**				

Semester 5							
Sl. No	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	CEC301A	Design of RCC Elements	2	1	0	3	100
2	CEC302A	Structural Analysis - 2	2	2	0	4	100
3	CEC303A	Geotechnical Engineering - 1	3	0	0	3	100
4	CEC304A	Hydrology and Irrigation Engineering	3	0	0	3	100
5	CEC305A	Transportation Engineering - 2	3	0	0	3	100
6	CEC306A	Drawing of RCC Structures	0	0	4	2	100
7	CEL307A	Geotechnical Engineering Laboratory	0	0	2	1	50
8	CEL308A	Extensive Survey Viva Voce	0	0	2	1	50
9	CES301A	Seminar	0	0	2	1	50
		Total	**13**	**03**	**10**	**21**	**750**
		Total number of contact hours per week	**26**				

Semester 6							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	CEC311A	Geotechnical Engineering - 2	3	0	0	3	100
2	CEC312A	Design of Steel Element	2	1	0	3	100
3	CEC313A	Estimation–Costing and Engineering Economics	2	0	2	3	100
4	CEC314A	DSM & Finite Element Analysis	2	0	2	3	100
5	CEC315A	Design & Drawing of Transportation & Irrigation Structures	0	0	4	2	100
6	CEC316A	Design & Drawing of Geotechnical & Environmental Structures	0	0	4	2	100
7	CEC317A	Design and Drawing of Steel Structures	1	0	2	2	100
8	CEL318A	CAE Laboratory	0	0	2	1	50
9	CEE31XA	Professional Core Elective - 1	4	0	0	4	100
		Total	**14**	**01**	**16**	**23**	**850**
Total number of contact hours per week			**31 hours**				

Semester 7							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	CEE41XA	Professional Core Elective - 2	4	0	0	4	100
2	CEE42XA	Professional Core Elective - 3	4	0	0	4	100
3	OEE41XA	Open Elective-1	3	0	0	3	100
4	CEP401A CEI401A	I] Project Work – 1 II] Internship (Choose one)	0	0	12	6	100
		Total	**11**	**00**	**12**	**17**	**400**
Total number of contact hours per week			**23 Hours**				

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Semester 8							
Sl. No.	Code	Course Title	Theory (h/W/S)	Tutorials (h/W/S)	Practical (h/W/S)	Total Credits	Max. Marks
1	CEP402A	Project Work - 2	0	0	24	12	100
		Total	**0**	**0**	**24**	**12**	**100**
Total number of contact hours per week			**24 Hours**				

Professional Core Elective Courses:

Group	VI Sem	
	Course code	PCE-1 Course Title
Group 1	CEE311A	Traffic Engineering
Group 2	CEE312A	Advance Structural Analysis
Group 3	CEE313A	Advanced Surveying -Remote Sensing and GIS
Group 4	CEE314A	Advanced Concrete Technology
Group 5	CEE315A	Solid Waste Management
Group 6	CEE316A	Ground Improvement Techniques

Group	VII Sem			
	Course code	PCE-2 Course Title	Course code	PCE-3 Course Title
Group 1	CEE411A	Pavement Materials, Equipment and Construction	CEE421A	Urban Transportation and Planning
Group 2	CEE412A	Pre-stressed Concrete Technology	CEE422A	Advanced Design of Reinforced Concrete Structures
Group 3	CEE413A	Advanced Hydrology	CEE423A	Water Shed Management
Group 4	CEE414A	Green Construction and Alternate Building Materials	CEE424A	Construction Management and Engineering Economics
Group 5	CEE415A	Air Pollution and Control	CEE425A	Environmental Impact Assessment
Group 6	CEE416A	Advanced Foundation Engineering	CEE426A	Reinforced Soil Structures

Note:

1. Students are required to select **one** Professional Core Elective Courses in the 6th Semester, one each from PCE-1 Group.
2. Students are required to select two Professional Core Elective courses in the 7th Semester one each from PCE-2 and PCE-3 Groups.

22. Open Elective Courses

A number of Open Elective Courses from Faculties of engineering, management and commerce, art and design, hospitality management and catering technology, pharmacy, dental sciences are offered as mentioned in the University's website. Students can choose the Open Electives on their own choice.

22.1. Innovation Courses in Lieu of Open Elective Courses

Students can take the following 3-credit innovation courses in lieu of Open Elective Courses.

a) Design Thinking and Innovation (21INO250A)
b) Skill Development (21INO251A)
c) Industrial Problem Solving and Hackathons (21INO252A)

23. Course Delivery: As per the Timetable

24. Teaching and Learning Methods

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

25. Assessment and Grading

25.1. Components of Grading

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

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

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

Marks obtained CE and SEE components have equal weightage (CE: 50% and SEE: 50%) in determining the final marks obtained by a student in a Course.

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

25.2. Continuous Evaluation Policies

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

25.2.1 Theory Courses

Theory Course

Sub Component	SC1 (Midterm Exam)	SC2 (Assignment - 1)	SC3 (Assignment -2 Innovative Component)	SC4 (Optional- Makeup midterm. To be offered with approval)
Weightage	25 %	12.5%	12.5%	25%
Marks	50	25	25	50

For a theory course, there shall be three subcomponents of CE (SC1, SC2 and SC3). Each subcomponent is evaluated individually as indicated in the table. It is mandatory that the first and the second components (SC1 and SC2) have to compulsorily be a midterm exam and an assignment respectively. The third component (SC3) has to be an innovative component and the activities to be spread over the entire semester. The third component can be 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) Any other

After the three subcomponents are evaluated, the CE component marks are determined as:
CE Component Marks = (Total of the marks obtained in all the three subcomponents) ÷ 2

25.2.2 Laboratory Course

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

Laboratory Course			
Sub Component	SC1	SC2	SC3 (Optional)
Weightage	25 %	25%	25%
Marks	25	25	25

The subcomponents can be of any of the following types:

a) Laboratory / Clinical Work Record
b) Experiments
c) Computer Simulations
d) Creative Submission
e) Virtual Labs
f) Viva / Oral Exam

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g) Lab Manual Report
h) Any other (e.g. combinations)

After the subcomponents of CE are evaluated, the CE component Marks are determined as:

CE Component Marks = (Total of the best two subcomponent marks out of the three) ÷ 2

25.2.3 Course Having a Combination of Theory and Laboratory

For a course that contains the combination of theory and laboratory sessions, the scheme for determining the CE marks is as under:

Theory Course					
Sub Component	SC1 (Midterm Exam)	SC2 (Assignment - 1)	SC3 (Assignment -2 Innovative Component)	LSC4 (Laboratory Component)	SC4 (Optional- Makeup midterm .To be offered with approval from authorities)
Weightage	20 %	10%	10 %	10%	25%
Marks	50	25	25	25	50

For a course having a combination of theory and laboratory, there shall be four subcomponents of CE (SC1, SC2, SC3 and LSC4). Each subcomponent is evaluated individually as indicated in the table. It is mandatory that first and the second components (SC1 and SC2) have to compulsorily be a midterm exam and an assignment respectively. The third component (SC3) has to be an innovative component and the activities to be spread over the entire semester. The fourth subcomponent (LSC4) is mandatory and shall be set to evaluate the students' performance in the laboratory. The third component can be any of the following types:

The theory assignment 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

The laboratory subcomponent can be of any of the following types:

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a) Laboratory / Clinical Work Record
b) Experiments
c) Computer Simulations
d) Creative Submission
e) Virtual Labs
f) Viva / Oral Exam
g) Lab Manual Report
h) Any other (e.g. combinations)

After the four subcomponents are evaluated, the CE component marks are determined as:
CE Component Marks = (Total of the marks obtained in all the four subcomponents is reduced to 50).

26. Minor Programme

The details of the following aspects of the minor programmes are presented in the **Academic Regulations** for the B. Tech. Degree Programme:

1. Programme Structure
2. Eligibility to Minor Programme
3. Registration to Minor Programme
4. Certification for Minor Programme

27. Student Support for Learning

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

28. Quality Control Measures

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

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

Sem.	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
1	Engineering Mathematics-1	3	3	2	3						2			3	3	2
1	Engineering Physics	3	3	3	3	1	1	1						3	3	
1	Engineering Mechanics	3	3	3										3		
1	Elements of Electronics Engineering	3	3											3		
1	Engineering Drawing	3	2			2					1			3	2	1
1	Engineering Physics Laboratory	3	2		3			2		1	2			3	3	2
1	Basic Electronics Laboratory	3	3			3					3			3	3	3
1	Constitution, Human Rights and Law	2	2	3				3						3	3	
2	Engineering Mathematics-2	3	3	2	2	2					1			3	2	1
2	Engineering Chemistry	3	3	3	2		3	3			3			3	3	3
2	Elements of Mechanical Engineering and Work shop Practice	3	3											3		
2	Elements of Electrical Engineering	3	3	3	2	2	2	2		1	1	1	1	3	2	1
2	Elements of Computer Science and Engineering	2	1	3	2	2	2		1			1	2	3	2	2
2	Engineering Chemistry Laboratory	3	2		3			2		1	3			3	3	3
2	Computer Programming Laboratory	2	1	3	2	2	2		1			1	2	3	2	2
2	Basic Electrical Engineering Laboratory	3	3	3	2	2				1	1			3	2	1
2	Professional Communication									3	3					3
3	Engineering Mathematics-3	3	3	2	2						2			3	3	2
3	Mechanics of Solids	3.	3	3	3	1				1	1			3	3	1
3	Mechanics of fluid	3	3	3	2	1				1	1			3	2	1
3	Engineering Survey	3	3	2										3		
3	Engineering Geology and Properties of Soils	3		3										3		
3	Building Materials, Concrete and Construction Technology	3	3	3	2	3								3	3	
3	Material Testing Laboratory	3			3					1				3	3	1
3	Survey Practice	3	3	3	3					1				3	3	1
3	Applied Engineering Geology Laboratory	3	1		2									3		
3	Environmental Studies	1					3		1					1	3	1
4	Engineering Mathematics – 4	3	3	2		2				1	1			3	2	1
4	Transportation Engineering – 1	3	2	2										3		
4	Structural Analysis – 1	3	3											3		
4	Hydraulics and Hydraulic Machines	3	3	3										3		
4	Environmental Engineering	3	2	3	3	3	3	3	2			3		3	3	3
4	Building Planning and Computer Aided Drafting	3		3				3						3	3	3

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Sem.	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
4	Hydraulics and Hydraulic Machines Laboratory	2	3		3					1				3	3	1
4	Environmental Engineering Laboratory	3	3		3	3		3		1				3	3	3
4	Concrete and Highway Materials Laboratory	3	3	3	2					1				3	2	1
4	Innovation and Entrepreneurship	2	3	2	2	3	3			3	3	3		2	2	3
5	Design of RCC Elements	3	3	3	2	3								3	3	
5	Structural Analysis - 2	3	3											3		
5	Geotechnical Engineering - 1	3	3	3		2					1		1	3	2	1
5	Hydrology and Irrigation Engineering	3	3	3			1							3	1	
5	Transportation Engineering - 2	3	3	2	1		1							3	1	
5	Drawing of RCC Structures	3	3	3		3			1		2	2		3	3	2
5	Geotechnical Engineering Laboratory	3	3	2	2	2				1				3	2	1
5	Extensive Survey Viva Voce	3	2	3	3							2	1	3	3	2
6	Geotechnical Engineering - 2	3	3	3		2				1	1			3	2	1
6	Design of Steel Element	3	3	3										3		
6	Estimation–Costing and Engineering Economics	3	3			3	3		2					3	3	2
6	DSM & Finite Element Analysis	3	3	3	3	1				1	1			3	3	1
6	Design & Drawing of Transportation & Irrigation Structures	3	3	3	2	3		1		2	2			3	3	2
6	Design & Drawing of Geotechnical & Environmental Structures		3	3	2		3							3	3	
6	Design and Drawing of Steel Structures	3	3	2	2	3		1	2	2	2	1		3	3	2
6	CAE Laboratory	3	3	2	3	3				1	1			3	3	1
6	Traffic Engineering	3	3	3	2	3								3	3	
6	Advance Structural Analysis	3	3	3		3	1			2	2			3	3	2
6	Advanced Surveying -Remote Sensing and GIS	3	2	3	1	3	1						1	3	3	
6	Advanced Concrete Technology	3	3	3	2	1				1	1			3	2	1
6	Solid Waste Management	3				2	3	3						3	3	
6	Ground Improvement Techniques	3	3	3	2	3								3	3	
7	Pavement Materials, Equipment and Construction	3	3	3	2		3	2						3	2	
7	Pre-stressed Concrete Technology	2	3	3	1									3	1	
7	Advanced Hydrology	3	3	3			1	1						3	1	
7	Green Construction and Alternate Building Materials	2		3	3	2				1				3	3	1

Sem.	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
7	Air Pollution and Control	3	2				3	2						3	3	
7	Advanced Foundation Engineering	3	3	3										3		
7	Project Work - 1	3	3	2	3	2	2		2	3	3	3	3	3	3	3
7	Internship											3	3			3
7	Seminar										2	3				3
7	Urban Transportation and Planning	3	3	2	2	2						1		3	2	1
7	Advanced Design of Reinforced Concrete Structures	2	3	3	2	1	1							3	2	
7	Water Shed Management	3	3	3	2	2	3	3						3	2	
7	Construction Management and Engineering Economics	3	3	2		3	3							3	3	
7	Environmental Impact Assessment	3	3					3	3			3		3	3	3
7	Reinforced Soil Structures	2	3	3	3		3						2	3	3	
8	Project Work - 2	3	3		3	2	2			1	3	1	3	3	3	3

30. 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.

31. 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.

32. 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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Course Specifications: Engineering Mathematics - 1

Course Title	Engineering Mathematics - 1
Course Code	MTB101A
Course Type	Core Theory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

The course introduces students to the basic concepts in real analysis and matrix algebra. Students are taught the concepts of limits, continuity, and differentiation, series expansion for the functions of one and two variables, sequence and series, convergence of series. The mathematical operations in Matrix theory, Eigen value and Eigen vector, Inversion and diagonalization of matrix and matrix solution for linear system of equations.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Mathematics and Statistics
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

- **CO-1.** State and discuss basic concepts related to single, two variable calculus and matrix algebra
- **CO-2.** Perform basic operations of matrix algebra and apply them to solve systems of linear equations
- **CO-3.** Solve simple mathematical problems associated with linear algebra, single and two variable calculus
- **CO-4.** Demonstrate competence with the basic ideas of linear systems, independence, bases and dimension, linear transformations, eigenvalues, eigenvectors and diagonalization
- **CO-5.** Solve complex real-world problems associated with linear algebra, single and two variable calculus

4. Course Contents

Unit 1 (Single Variable Calculus): Functions of single real variable, limit, continuity and differentiation. Rolle's Theorem and Lagrange's mean value theorem and their applications. Fundamental theorem of integral calculus. Improper integrals - classification and convergence, gamma and beta functions. Sequence of real numbers, Series, Tests for convergence of series: integral test, comparison test, ratio test and root test. Power series, Taylor and Maclaurin series.

Unit 2 (Two Variable Calculus): Functions of two variables, limits, continuity and partial differentiation. Total differential, errors and approximations, tangent plane approximation of a surface. Partial differentiation of composite and implicit functions, Taylor's theorem. Unconstrained and constrained extrema.

Unit 3 (Linear Algebra): Matrix algebra, elementary row operations, row and reduced row echelon forms. Linear system of equations, existence and uniqueness of solution. Vector spaces, subspaces, linear independence, basis and dimension. Row, column and null space of a matrix. Linear transformations. Eigenvalues, eigenvectors and diagonalization.

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

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

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		45
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		15
1. Solving Numerical Problems	15	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**70**

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7. Course Assessment and Reassessment

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

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

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			Component 2: SEE (50% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Midterm exam	Assignment -1	Assignment-2	100 Marks
Maximum Marks ▶	50	25	25	
CO-1	▯	▯		▯
CO-2	▯	▯		▯
CO-3	▯	▯		▯
CO-4			▯	▯
CO-5			▯	▯
CO-6			▯	▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

8. Achieving COs

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

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

9. Course Resources

a. Essential Reading

1. James Stewart, 2015, Calculus: Early Transcendentals, 8th edition, Boston, Cengage Learning
2. Steven Leon, 2014, Linear Algebra with Application, 9th edition, New Jersey, Pearson

b. Recommended Reading

1. Maurice D. Weir and Joel Hass, 2017, Thomas Calculus, 13th edition, New Jersey, Pearson
2. Gilbert Strang, 2016, Introduction to Linear Algebra, 5th edition, Massachusetts, Cambridge Press

c. Magazines and Journals

d. Websites

1. https://www.coursera.org/
2. http://nptel.ac.in/

e. Other Electronic Resources

1. https://ocw.mit.edu/index.htm
2. https://www.khanacademy.org/
3. tutorial.math.lamar.edu/

10. Course Organization

Course Code	MTB101A	
Course Title	Engineering Mathematics - 1	
Course Leader's Name	As per Timetable	
Course Leader's Contact Details	**Phone:**	080 4906 5555
	E-mail:	hod.mt.mp@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date	June 2026	

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Course Specifications: Engineering Physics and Laboratory

Course Title	Engineering Physics and Laboratory
Course Code	PYB102A
Course Type	Core Theory and Laboratory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary:

The aim of this course is to impart concepts of Physics and its application to solve engineering problems. The students are taught the basic topics in modern physics which include wave particle duality, uncertainty principle, Schrodinger's wave equation, lasers and fiber optics. Electrical and mechanical properties of materials will be discussed in relation to the crystal structure. This course also intends to expose the students to the challenges and rewards related to experimental physics. Students gain hands-on experience by conducting experiments in a controlled laboratory environment. Students are trained to conduct experiments related to mechanics, optics and electric circuits. They are trained to analyze the measurements, results and infer appropriate conclusions based on fundamental concepts of physics

2. Course Size and Credits:

Number of credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:0:1
Total hours of interaction	75
Number of Weeks in a Semester	15
Department responsible	Physics
Total Course Marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

3. Course Objectives (CO)

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

CO - 1	State, explain the concepts of mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser and fiber optics
CO - 2	Derive standard relationships in mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser & fiber optics, and interpret them
CO - 3	Discuss the applications of mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser and fiber optics
CO - 4	Solve problems in mechanics, electrical conductivity, quantum mechanics, crystal structure, material science, laser and fiber optics
CO - 5	Plan the experimental set-up, conduct experiments, calculate and plot the graphs to obtain the results and write a laboratory report as per the prescribed format.

4. Course Contents

Unit 1 – (Elasticity): Review of Elasticity — Expression for Y, h and K in terms of linear and lateral strains (Deformation of a cube)—Poisson's ratio—Twisting couple on a cylinder—Expression for couple per unit twist—Torsion Pendulum -- determination of rigidity modulus of a wire using torsion pendulum—Bending of beams— Geometrical moment of inertia of circular and rectangular cross sections—Single cantilever—Expression for Young's modulus of a cantilever beam

Unit 2 – (Rigid body dynamics): Review of Rigid body dynamics — Expressions for moments of inertia of a circular disc and rectangular plate about different axes—MI of Flywheel

Unit 3 – (Quantum theory of radiation): Blackbody spectrum—Wien's law—Raleigh-Jeans law—Stefan-Boltzmann law—Planck's quantum theory—Reduction of Planck's formula to Raleigh Jeans and Wien's formulae—Compton effect—Wave particle dualism—de Broglie hypothesis and matter waves—Phase velocity and group velocity of matter waves

Unit 4 – (Quantum Mechanics): Heisenberg's uncertainty principle—Applications of Heisenberg's uncertainty principle—wave function and its properties - Setting up of Schrodinger's one-dimensional time independent wave equation—Application of Schrodinger's equation to a particle in an infinite potential well to determine eigen values and eigen functions

Unit 5 – (Lasers): Interaction of radiation with matter - Absorption, spontaneous emission and stimulated emission - Characteristics of laser light - Expression for the energy density of electromagnetic radiation – Requisite conditions for production of a laser beam—Helium-Neon laser—Semiconductor laser—Applications of lasers—Lidar—laser isotope separation—laser fusion

Unit 6 – (Optical Fibers): Principle-- Angle of acceptance—Expression for Numerical aperture--condition for propagation—Intermodal dispersion-- material dispersion—Refractive index profiles of step index and graded index fibers(GRIN)—Modal propagation in step index and GRIN fibers –Attenuation—Different types of loss mechanisms--Fiber optic communication system

Unit 7 – (Crystal structure): Space lattice—Bravais lattice—Lattice parameters—unit cell and primitive cell—Crystal systems - Miller indices - Indexing directions and planes in a crystal - Atomic packing fraction and coordination number for simple, body centered and face centered cubic Crystals - Expression for inter planar Spacing - Structures of NaCl and diamond crystals—Bragg's law—Identification of cubic crystals using Bragg's law

Unit 8 – (Electrical conductivity of metals): Review of Classical free electron theory - Failure of classical free electron - Quantum free electron theory—Density of States (Qualitative) – Fermi energy – Fermi factor - Effect of temperature on Fermi-Dirac Distribution functio

Unit 9 – (Lab Experiments)

1. Determination of the relationship between the torque and angular acceleration of a flywheel
2. Determination of the (i) the moment of inertia of the given disc and (ii) the rigidity modulus of the material of a wire by torsional oscillations
3. Analysis of Powder X-ray diffraction pattern.
4. Determination of Young's modulus of material of a beam by uniform bending method.
5. Determination of radius of curvature of a plano-convex lens by setting up Newton's rings.

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6 Determination of the wavelength of prominent spectral lines of Hg source using diffraction grating with minimum deviation method.
7 Determination of thickness of paper by air wedge experiment.
8 Determination of efficiency of Solar cell.
9 Determination of Planck's constant using LED.
10 Study of I-V characteristics of Zener diode
11 Determination of the frequency response of series and parallel resonance circuit and to find the resonant frequency and quality factor.
12 Determination the width of the forbidden energy gap in a semiconductor diode.
13 Determination of dielectric constant of a material by charging and discharging a capacitor.

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

	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3		2		1								3	1	0
CO-2	2	1	3	3		1	1						3	2	0
CO-3	3	2											3	0	0
CO-4	3	2	2	1									3	1	0
CO-5	3	2		3			2		1	2			3	3	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models / Systems		
3. Demonstration on a Computer		
Numeracy		13
1. Solving Numerical Problems	13	
Practical Work		30
1. Course Laboratory	30	
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		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Term Tests, Written Examination		10

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Total Duration in Hours	85

7. Course Assessment and Reassessment

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

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (TSC1, TSC2, TSC3 or LSC4), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation						
Course Outcome	CE (Weightage: 50 %)				SEE (Weightage: 35 %)	Lab (Weightage: 15 %)
	TSC1: (20 %) Midterm exam	TSC2: (10 %) Assignment	TSC3: (10 %) Innovative	LSC4: (10 %) CE	Written exam	LSEE: SEE
	50 marks	25 Marks	25 Marks	25 Marks	100 Marks	25 Marks
CO-1	▯		▯		▯	
CO-2	▯	▯	▯		▯	
CO-3	▯	▯	▯		▯	
CO-4	▯	▯	▯		▯	
CO-5				▯		▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.						

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

8 Achieving COs

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

S. No.	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Class room lectures, and demonstrations
3.	Critical Skills	Assignment
4.	Analytical Skills	Class room, assignment
5.	Problem Solving Skills	Class room, assignment
6.	Practical Skills	Class room, assignment
7.	Group Work	Classroom
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	Presentation
11.	Presentation Skills	Presentation

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12.	Behavioral Skills	Course
13.	Information Management	Assignment, examination
14.	Personal Management	Assignment, examination
15.	Leadership Skills	Effective management of learning, time management, achieving the learning

9. Course Resources

a. Essential Reading

1. Class Notes
2. Rajendran, V. (2011) Engineering Physics, TMH
3. Srinivasan M. R. (2011) Physics for Engineers, 3rd Ed, New Age International
4. Gyan Prakash, (2012) Experimental Physics,
5. Michael Sayer, Abhai Mansingh, (1999) Measurement, Instrumentation and Experiment Design in Physics and Engineering, PHI

b. Recommended Reading

1. Halliday, I.D., Resnick, R and Walker, J (2010) Fundamentals of Physics, 9thEd, Wiley
2. Richtmeyer, F. K., Kennard, E.H. and Cooper, J.N (2007) Modern Physics, 6thEd, TMH
3. Beisser, A. (2009) Concepts of Modern Physics, 6th Ed, TMH
4. Kittel, C. (2010) Introduction to Solid State Physics, 8th Ed, Wiley
5. S.O. Pillai (2011), A Textbook of Solid State Physics, 6th Ed, New Age International
6. Srinivasan M.R. (2011) Applied Solid State Physics, 1st Ed, New Age International
7. Giri, P.K., (2005) Physics Laboratory Manual for Engineering Undergraduates, Department of Physics, Indian Institute of Technology Guwahati

c. Magazines and Journals

d. Websites

1. http://nptel.ac.in/
2. Other Electronic Resources

e. Electronic resources on the subject area are available on MSRUAS library

10. Course Organization

CourseCode	PYB102A		
Course Title	Engineering Physics and Laboratory		
Course Leader/s Name		As per Time - table	
Course Leader Contact Details		**Phone:**	+91-804-906-5555
		E-mail:	hod.pi.mp@msruas.ac.in
Course Specifications Approval Date		**June 2022**	
Next Course Specifications Review Date		**June 2026**	

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Course Specifications: Engineering Mechanics

Course Title	Engineering Mechanics
Course Code	CEF101A
Course Type	Core Theory Course
Department	Civil Engineering
Faculty	Engineering and Technology

11.Course Summary

This subject deals with laws of engineering mechanics for static and dynamics equilibrium of rigid bodies. The students will be trained on application of engineering mechanics to solve practical problems pertaining to various force systems and static and dynamic equilibrium of rigid bodies.

12. Course Size and Credits:

Number of Credits	03
Credit Structure (Lecture:Tutorial:Practical)	3:0:0
Total Hours of Interaction	45
Number of Weeks in a Semester	15
Department Responsible	Civil Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

13. Course Outcomes (COs)

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

CO-6. State and describe the laws of Statics, Friction and Dynamics and their contexts of application.
CO-7. Interpret standard mathematical relationships and apply for solving problems when rigid bodies are subjected to different force systems
CO-8. Apply the concepts of equilibrium for solving the problems on rigid bodies
CO-9. Determine centroid/center of gravity for various plane shapes and calculate moment of inertia for the structural members
CO-10. Apply the laws of statics for the analysis of rigid bodies with and without friction

14. Course Contents

Unit 1 (Engineering Mechanics): Branches of mechanics and its importance: Engineering Design , Mechanics in engineering, Introduction to SI units , Basic idealisations - Particle, Continuum, Rigid body and Point force with examples, principles of mechanics with examples- laws of parallelogram, law of transmissibility, gravitation, Classification of force and force systems; Principle of physical

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independence of forces, Principle of superposition of forces; constraints on rigid bodies and corresponding reactions, Moment of a force, couple, moment of a couple, characteristics of couple, Equivalent force - couple system; Resolution of forces, composition of forces; Numerical problems on moment of forces and couples, equivalent force and couples.

Unit 2 (Analysis of Coplanar Concurrent and Non-Concurrent System of Forces): Varignon's theorem, resultant of Concurrent and non-concurrent force systems. Equilibrium of Structural Systems: Types of forces acting on a body, Free Body diagram Analysis, Lami's Theorem, Equilibrium of connected bodies, types of supports in beams, determination of support reactions, Applications to engineering problems.

Unit 3 (Centroid of planes and Moment of inertia of area): Differences between centre of gravity and Centroid, use of axis of symmetry, Centroid of simple built-up sections by integration, Moment of Inertia of planes, radius of gyration, Theorems of moment of inertia, moments of inertia of standard sections by integration, Numerical Examples.

Unit 4 (Friction in Engineering Systems): Laws of friction, angle of friction, angle of repose, cone of friction, Analysis of blocks resting on horizontal and inclined planes, rolling friction, rope friction, Application to wedge and ladder problems, problems involving non concurrent force systems.

Unit 5 (Introduction to dynamics): General principles and types of motions and D'Alembertsprinciple with examples, Newton's laws of motion. Linear motions and projectiles -Motion with uniform velocity and acceleration, motion with varying acceleration, motion of bodies projected horizontally, projection on inclined planes.

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

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

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16. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		10
Demonstrations		0
1.Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		30
1. Solving Numerical Problems	30	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**55**

17. Course Assessment and Reassessment

The components and subcomponents of course assessment are presented in the Academic Regulations document pertaining to the B. Tech. 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.

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Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			Component 2: SEE (50% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Midterm exam	Assignment -1	Assignment -2	100 Marks
Maximum Marks ▶	50	25	25	
CO-1	▯		▯	▯
CO-2	▯	▯	▯	▯
CO-3	▯		▯	▯
CO-4		▯	▯	▯
CO-5		▯	▯	▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

Course reassessment policies are also presented in the Academic Regulations document.

18. Achieving COs

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

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

19. Course Resources

f. Essential Reading

1. Class notes
2. S. S. Bhavikatti, (2021), Engineering Mechanics, New Age International
3. R K Rajput (2011), A Text Book of Applied Mechanics, 3rd Edn, Laxmi Publications

g. Recommended Reading

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Bangalore

1. S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati (2017), Engineering Mechanics, McGraw Hill Education
2. C. Lakshamanarao, J. Lakshinarashiman, Raju Sethuraman, Srinivasan M. Sivakumar (1993), Engineering Mechanics: Statics and Dynamics, PHI, New Delhi

h. Magazines and Journals

1. Journal of Engineering Mechanics
2. International Journal for Theoretical and Applied Mechanics

i. Websites

1. https://ascelibrary.org/journal/jenmdt

j. Other Electronic Resources

1. https://nptel.ac.in/

20. Course Organization

Course Code	CEF101A	
Course Title	Engineering Mechanics	
Course Leader's Name	As per Timetable	
Course Leader's Contact Details	**Phone:**	+91-804-906-5555
	E-mail:	hod.ce.et@msruas.ac.in
Course Specifications Approval Date	June 22	
Next Course Specifications Review Date	June 26	

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Bangalore

Course Specifications: Elements of Electronics Engineering and Laboratory

Course Title	Elements of Electronics Engineering and Laboratory
Course Code	ECF102A
Course Type	Core Theory and Laboratory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

The aim of this course is to create a strong foundation of Digital Electronics. The students are taught the basic components of digital systems and the process of their implementation. The students are also taught Boolean algebra, logic gates, basics of memories, and implementation of combinational and sequential digital circuits using logic gates. This course also emphasizes on different types of memories and logic designing platforms and their merits and demerits. Students are trained to employ the principles of digital electronics to implement digital design for the given problem. Basic electronics laboratory deals with practical applications of electronic circuits and their theoretical concepts.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:0:2
Total Hours of Interaction	75
Number of Weeks in a Semester	15
Department Responsible	Electronics and Communication Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

- **CO-1.** Explain working principles of PN junction diode, Zener diode, transistors, amplifier configurations, Op-Amps, power supply, logic gates and electronic displays
- **CO-2.** Derive mathematical relationships for electronic devices and circuits
- **CO-3.** Solve simple numerical and design problems related to analog / digital circuits as well as devices
- **CO-4.** Design and Analyse operation of standard analog / digital circuits for a given application
- **CO-5.** Conduct experiments as per the standard procedures and tabulate/calculate/plot the measured values
- **CO-6.** Interpret and compare with standard results, and draw conclusions and Write report as per the prescribed format

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4. Course Contents

Unit 1 (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, Diode as voltage multiplier, clipper and clamper circuit, Zener diode characteristics, Zener diode as a voltage regulator.

Unit 2 (Transistor- BJT): Transistor configurations: CB, CE and CC; Transistor parameters: alpha, beta and gamma, working of transistor as a switch, Amplifier; Transistor biasing – Base, Collector-to-base and Voltage Divider Bias.

Unit 3 (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.

Unit 4 (Power Supplies): Introduction and working of Switched Mode Power Supply (SMPS), Voltage Regulator, Introduction to Inverters and UPS.

Unit 5 (Digital Electronics): Binary, Octal and Hexadecimal number systems and conversions, Boolean Algebra, Truth table of logic gates- AND, OR, NOT, NAND, NOR; Universal gates; Generation of Integrated Circuits- SSI, MSI, LSI and VLSI.

Unit 6 (Laboratory): List of Experiments

1	Forward and Reverse bias V-I Characteristics of a P-N Junction diode
2	Forward and Reverse bias V-I Characteristics of Zener diode
3	Half wave and Full wave Rectifier circuits: a) Output of half/full wave rectifier with and without capacitor filter.
4	Bridge Rectifier circuits: a) Output of bridge rectifier with and without capacitor filter
5	Clipping circuits (Shunt clippers) Clipping circuits (Series clippers)
6	Clamping circuits
7	Characteristics of Op-amp inverting and non- inverting amplifiers
8	Logic Gates circuits: Verification of the truth tables of AND, OR, NOT, NAND, NOR, and EX-OR gates.

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

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

6. Course Teaching and Learning Methods

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Programme Structure and Course Details of B. Tech in Civil Engineering 2022-

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		33
Demonstrations		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		10
1. Solving Numerical Problems	10	
Practical Work		30
1. Course Laboratory	30	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**85**

7. Course Assessment and Reassessment

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

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (TSC1, TSC2, TSC3 and LSC4), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation						
Course Outcome	**CE (Weightage: 50 %)**				**SEE (Weightage: 35 %)**	**Lab (Weightage: 15 %)**
	TSC1: (20 %) Midterm exam	**TSC2: (10 %) Assignment**	**TSC3: (10 %) Innovative**	**LSC4: (10 %) CE**	**Written exam**	**LSEE: SEE**
	50 marks	**25 Marks**	**25 Marks**	**25 Marks**	**100 Marks**	**25 Marks**
CO-1	▯		▯		▯	
CO-2	▯	▯	▯		▯	
CO-3	▯	▯	▯		▯	
CO-4	▯	▯	▯		▯	
CO-5				▯		▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.						

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

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

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

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments, Laboratory instruction
2.	Understanding	Class room lectures, Assignments, Laboratory instructions and experiments
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	Laboratory Work
7.	Group Work	Laboratory Work
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination, Laboratory work
10.	Verbal Communication Skills	Laboratory work
11.	Presentation Skills	--
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, examination, Laboratory
14.	Personal Management	Course work
15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

1. Class Notes
2. Millman and Halkias, 2001, Integrated Electronics, Tata McGraw-HillEducation
3. Robert Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory,7th Ed. Prentice Hall
4. Dale R. Patrick, 1989, Electricity and Electronics Laboratory, The Goodheart-willcox Company Inc, Illinois

b. Recommended Reading

1. Albert Malvino, 2006, Electronic Principles, Tata McGraw - Hill Education
2. Donald L. Shilling & Charles Belowl, 1968, Electronic Circuits, New York: McGraw-Hill
3. Tocci R J and Widmer N S, 2001, Digital Systems – Principles and Applications, 8th Ed., Pearson Education India, New Delhi
4. Cooper and Helfrick, 1996, Modern Electronic Instrumentation and Measuring Techniques, 4th print Prentice Hall of India, New Delhi

5. H S Kalsi, 2007, Electronic Instrumentation, TMH, 2nd Edition
6. R A Gaikwad, 2001, Op-Amps and Linear Integrated Circuits, PHI, 4th edition
7. Millman and Grabel, 1999, Microelectronics, 2nd Ed. Tata McGraw-Hill
8. Louis R. Nardizzi, 1973, Basic circuits and electronics experiments, Van Nostrand
9. George B. Rutkowski, 1984, Basic electricity for electronics, Bobbs-Merrill Educational Pub.
10. Russell L. Meade, 2003, Foundations of Electronics: Circuits and Devices, Delmar learning, a division of Thomson learning, Inc.

c. Magazines and Journals

1. Electronics For You
2. IEEE Transaction on Circuits and System I and II

d. Websites

1. http://www.electronics-lab.com
2. http://www.labmanager.com
3. http://electronicsforu.com
4. http://www.lifescienceleader.com

e. Other Electronic Resources

1. https://ocw.mit.edu/index.htm MultiSim software
2. Analog trainer kit
3. Digital trainer kit
4. Discrete electronic components

10. Course Organization

Course Code	ECF102A	
Course Title	Elements of Electronics Engineering and Laboratory	
Course Leader's Name	As per Timetable	
Course Leader's Contact Details	**Phone:**	080-49065555
	E-mail:	hod.ec.et@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date	June 2026	

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Course Specifications: Engineering Drawing

Course Title	Engineering Drawing
Course Code	MEF103A
Course Type	Core Theory and Laboratory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

This course deals with graphical representation of geometrical entities in various views for visualization and communication. The students will be taught orthographic and isometric projection of points, lines, planes and solids. The students will be taught sections and development of solids. The students will be equipped to visualize and apply principles of orthographic projection to given application. The students will also be trained to use CAD tool to carry out these geometric projections.

2. Course Size and Credits

Number of Credits	03
Credit Structure (Lecture: Tutorial: Practical)	2:0:1
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Mechanical and Manufacturing Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

CO-1. Describe the conventions used in projections of geometric entities and interpret the same

CO-2. Draw orthographic projections for the geometric entities in specified positions

CO-3. Develop lateral surfaces of un-sectioned and sectioned regular solids

CO-4. Develop orthographic projections for given applications

CO-5. Draw isometric projections for the solids and their combinations

CO-6. Demonstrate competency in using CAD tool for drawing projections of geometric entities

4. Course Contents

Unit 1 (Introduction to Engineering Drawing and CAD Tool): Drawing Instruments and their uses, BIS conventions and specifications, Dimensioning and Significance of Lettering, Graphical User Interface (GUI), Co-ordinate system and reference planes. Definitions of Horizontal Plane (HP), Vertical Plane (VP), Right Profile Plane (RPP) & Left Profile Plane (LPP). Creation of 2D/3D environment. Selection of drawing size and scale. Creation of geometric entities and text.

Modification and editing of geometric entities. Dimensioning, line conventions and material conventions

Unit 2 (Orthographic Projections- Points and Lines): Definitions - Planes of projection, reference line and conventions employed. Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant, first angle projection), True and apparent lengths, True and apparent inclinations to reference planes (simple problems).

Unit 3 (Orthographic Projections - Planes (First Angle Projection): Definitions–projections of plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle. Planes in different positions by change of position method only.

Unit 4 (Orthographic Projections – Solids (First Angle Projection): Definitions – Projections of solids–cube, prisms, cylinder, pyramids, cones and tetrahedron in different positions.

Unit 5 (Orthographic Projections – Section of Solids and Development of Surfaces (First Angle Projection): Section planes, Sections, Section views, Apparent shapes and True shapes of sections of right regular prisms, pyramids, cylinders and cones resting in simple positions.

Unit 6 (Isometric Projections using Isometric Scale) : Section planes, Sections, Section views, Apparent shapes and True shapes of sections of right regular prisms, pyramids, cylinders and cones resting in simple positions. Application of Projection of points and lines to given situation.

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

	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3												3		
CO-2	3	2								1			3		1
CO-3	3	2								1			3		1
CO-4	3	2								1			3		1
CO-5	3	2								1			3		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		30
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		00
1. Solving Numerical Problems	00	
Practical Work		30
1. Course Laboratory	00	
2. Computer Laboratory	30	

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3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	00
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**70**

7. Course Assessment and Reassessment

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

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

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			**Component 2: SEE (50 % Weightage)**
Subcomponent ▶	**SC1**	**SC2**	**SC3**	
Subcomponent Type ▶	**Mid Term**	**Assignment -1**	**Assignment -2**	**100 Marks**
Maximum Marks ▶	**50**	**25**	**25**	
CO-1	▯	▯	▯	▯
CO-2	▯	▯	▯	▯
CO-3			▯	▯
CO-4	▯	▯		▯
CO-5			▯	▯
CO-6`	▯			▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

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

teaching and learning methods:

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

9. Course Resources

a. Essential Reading

1. Course notes
2. K. R. Gopalakrishna, 2005, Engineering Graphics, 32nd Edition, Shubhash Publishers

b. Recommended Reading

1. W. J. Luzadder, 2006, Fundamentals of Engineering Drawing, 11th Edition, Prentice Hall India
2. N. D. Bhatt and V. M. Panchal, 2006, Engineering Drawing, 49th Edition, Charotar Publishing House
3. CAD Tool Users Manuals

c. Magazines and Journals

d. Websites

1. http://nptel.ac.in

e. Other Electronic Resources

1. Electronic resources on the course area are available on MSRUAS library

10. Course Organization

Course Code	MEF103A		
Course Title	Engineering Drawing		
Course Leader's Name		As per Timetable	
Course Leader's Contact Details		**Phone:**	+91-804-906-5555
		E-mail:	hod.me.et@msruas.ac.in
Course Specifications Approval Date		June 2022	
Next Course Specifications Review Date		June 2026	

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Course Specifications: Constitution, Human Rights and Law

Course Title	Constitution, Human Rights and Law
Course Code	LAN101A
Course Type	Ability Enhancement Compulsory Course
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

This course aims at enabling students understand the key principles of Indian Constitution, Human Rights and Law. The course facilitates the understanding of the framework of Indian constitution and the judicial and the legal systems that guides Indian citizens. It aims at building awareness about the application of Human Right principles and Law. It allows students to work towards the formulating realistic solutions for protection of human rights.

2. Course Size and Credits

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

3. Course Outcomes (COs)

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

CO-1. Explain the key principles of the Indian Constitution
CO-2. Explain Indian legal system and judicial structure that govern the citizens
CO-3. Discuss UN Declaration of Human Rights
CO-4. Discuss the scope and application of Human Rights Principles and Law
CO-5. Suggest strategies for protection of human rights and resolving legal issues in compliance with applicable laws

4. Course Contents

Unit 1 (Constitution of India): The framework of Constitution of India, Constituent Assembly, The Constitution and the government, The constitution and the judiciary, The constitution and the legislature.

Unit 2 (Introduction to Law): Indian Legal System and Judicial Structure, Liability under the Law, Issues relating to Good Corporate Governance, Company Law.

Unit 3 (Concept of Human Rights and Duties): Inherent, inalienable, universal, indivisible, values, dignity, liberty, equality, justice, unity in diversity, classification of rights, classification of duties, correlation of rights and duties, need for balance between rights and duties, freedom and responsibility.

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Unit 4 (International Human Rights Standards and UN): Universal declaration of human rights 1948, international covenant on civil and political rights 1966, international covenant on economic, social and cultural rights 1966, UN system and human rights, convention on elimination of all forms of racial discrimination 1965, convention on elimination of all forms of discrimination against women 1979, convention on the rights of the child 1989, UN declaration and duties and responsibilities of individuals 1997, UN agencies to monitory compliance such as UN high commission for human rights.

Unit 5 (Contract Law and Disputes): Formation of Contract: offer and acceptance, Terms of Contract: avoidance, representation, illegality, Breach of Contract and Remedies, Industrial Disputes Act, Negligence, Trespass and Breach of Statutory Duty, Litigation, Arbitration, Judicial Remedies.

Unit 6 (Intellectual Property Law): Copyright, Protection and Infringement of Copyright, Trade Marks, Protection of Trade Marks and Passing-off, Patents, Ownership and Protection of Patents, Product Liability, Government Schemes for IPR Protection.

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

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

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		0
1.Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		0
1. Solving Numerical Problems	00	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	

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6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**40**

7. Course Assessment and Reassessment

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

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

Focus of COs on each Component or Subcomponent of Evaluation			
	Component 1: CE (50% Weightage)		**Component 2: SEE (50% Weightage)**
Subcomponent ▶	**SC1**	**SC2**	
Subcomponent Type ▶	**Midterm Exam**	**Assignment**	**50 Marks**
Maximum Marks ▶	**25**	**25**	
CO-1	X	X	X
CO-2			X
CO-3		X	X
CO-4	X		
CO-5	X	X	X
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.			

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

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

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

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Face to face lectures
2.	Understanding	Face to face lectures, group discussions
3.	Critical Skills	
4.	Analytical Skills	Face to face lectures, activities, group discussions, assignments
5.	Problem Solving Skills	

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6.	Practical Skills	Face to face lectures, activities, group discussions, course work
7.	Group Work	Course work, practice, assignment, group discussion
8.	Self-Learning	Course work, practice, assignment, group discussion
9.	Written Communication Skills	Face to face lectures, Course work, practice, assignment, group discussion
10.	Verbal Communication Skills	Face to face lectures, Course work, practice, assignment, group discussion
11.	Presentation Skills	
12.	Behavioral Skills	Course work, practice, assignment, group discussion, presentation practice, role plays
13.	Information Management	Assignment
14.	Personal Management	Face to face lectures
15.	Leadership Skills	Face to face lectures, group discussions

9. Course Resources

a. Essential Reading

1. Course notes
2. Tulsian, PC. (2008) Business Law, Tata McGraw Hill, New Delhi
3. Donnelly, J. (1998) International Human Rights, 2nd edn, Westview Press

b. Recommended Reading

1. Gulshan , S. S and Kapoor, G. K. (2005) Business Law including Corporate Laws, New Age International (P) Ltd. Publishers, New Delhi
2. Perry, M. (1998) The Idea of Human Rights, Oxford University Press
3. K Swamyraj (2017), Law of Contract (General Principles), God's Grace Publication, New Delhi
4. D D Basu (1983), Constitutional Law of India, Lexis Nexis Butterworths Publication, Nagpur
5. Introduction to Intellectual Property Theory and Practice (1997), World Intellectual Property Organisation, Geneva
6. Smith, R. (2007) Textbook on international human rights 3rd edn, Oxford University Press

c. Magazines and Journals

d. Websites

1. http://industrialrelations.naukrihub.com/industrial-relation-policy.htm
2. http://labour.nic.in/
3. http://whitepapers.businessweek.com/tlist/Legal-Environment.html
4. http://nptel.ac.in/

e. Other Electronic Resources

1. Electronic resources on the course area are available on MSRUAS library

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10.Course Organization

Course Code	LAN101A		
Course Title	Constitution, Human Rights and Law		
Course Leader's Name		As per Timetable	
Course Leader's Contact Details		**Phone:**	080-49065555
		E-mail:	School of Law
Course Specifications Approval Date		June 2022	
Next Course Specifications Review Date		June 2026	

Course Specifications: Engineering Mathematics - 2

Course Title	Engineering Mathematics - 2
Course Code	MTB102A
Course Type	Core Theory
Department	Applicable for all programmes
Faculty	Engineering and Technology

1. Course Summary

This course deals with analytical solutions of ordinary differential equations and Laplace transform. Students are taught the concepts of fundamentals of ordinary differential equations and Laplace transform. The solution procedures for certain standard forms of ordinary differential equations are illustrated. The role, relevance of ordinary differential equations in modelling some of the real world problems are emphasized and this course also covers the underlying principles and applications of transform techniques in various engineering disciplines.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Mathematics and Statistics
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

CO-1. Describe the fundamentals of ordinary differential equations and Laplace transform

CO-2. Solve standard forms of ordinary differential equations

CO-3. Solve simple problems in ordinary differential equations and Laplace transform

CO-4. Model real world problems using ordinary differential equations and solve complex problems associated with ordinary differential equations using Laplace transform

CO-5. Apply Laplace transform in solving complex real world engineering problems

4. Course Contents

Unit 1 (First Order Differential Equation): First order differential equations - Introduction, basic concepts and geometrical meaning. Separable, linear and exact differential equations. Integrating factors and transformations. Applications of first order ordinary differential equations: orthogonal trajectories, growth/decay problems and mixture problems

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Unit 2 (Higher Order Differential Equation): Introduction, initial and boundary value problems. Linear homogenous/nonhomogeneous differential equations with constant coefficients, method of undetermined coefficients and variation of parameters. Cauchy-Euler equations. Application of second order linear differential equations with constant coefficients, mass-spring-dashpot system, electric circuits. System of linear differential equations of first order, solutions by matrix method.

Unit 3 (Laplace Transform): Definition, properties and theorems, transform of derivatives, integrals, periodic functions, unit step function, Dirac's delta function and time shifting property. Inverse Laplace transform, convolution theorem, solution of initial value problems

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

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

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		45
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		15
1. Solving Numerical Problems	15	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**70**

7. Course Assessment and Reassessment

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

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

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			Component 2: SEE (50% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Midterm exam	Assignment -1	Assignment -2	100 Marks
Maximum Marks ▶	50	25	25	
CO-1	▯	▯		▯
CO-2	▯	▯		▯
CO-3	▯	▯		▯
CO-4			▯	▯
CO-5			▯	▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

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

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

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15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

5. Glyn James, 2016, Advanced Modern Engineering Mathematics, 4th edition, Pearson Dennis Zill, 2012,
6. A First Course in Differential Equations, 10th edition, Massachusetts, Brooks/Cole
7. Shepley Ross, 2007, Introduction to Ordinary Differential Equations, 4th edition, New York, John Wiley & sons

b. Recommended Reading

1. George Simmons, 2017, Differential Equations with Applications and Historical Notes, 2nd edition, New Jersey, McGraw Hill
2. Dennis Zill and Warren Wright, 2011, Advanced Engineering Mathematics, 4th edition, Jones and Bartlet
3. Erwin Kreyszig, 2015, Advanced Engineering Mathematics, tenth edition, John Wiley & Sons Inc.

c. Magazines and Journals

d. Websites

1. http://nptel.ac.in/
2. https://ocw.mit.edu/index.htm

e. Other Electronic Resources

1. https://www.khanacademy.org/
2. tutorial.math.lamar.edu/

10. Course Organization

Course Code	MTB102A		
Course Title	Engineering Mathematics - 2		
Course Leader's Name		As per Timetable	
Course Leader's Contact Details		**Phone:**	+91-804-906-5555
		E-mail:	hod.mt.mp@msruas.ac.in
Course Specifications Approval Date		**June 2022**	
Course Specifications Approval Date		June 2026	

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Course Specifications: Engineering Chemistry and Laboratory

Course Title	Engineering Chemistry and Laboratory
Course Code	CYB104A
Course Type	Core Theory and Laboratory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

This subject aims at enhancing the basic understanding of chemistry with reference to engineering systems and to train students to perform quantitative analysis related to Engineering Chemistry.
This subject deals with topics on electrochemistry, energy stage devices, fuels, chemical kinetics, corrosion science, metal finishing, polymers and nanomaterials.
Students are trained to determine physical and chemical properties of a given sample experimentally. They are trained to analyze the results and infer appropriate conclusions based on concepts of Engineering Chemistry.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:0:1
Total Hours of Interaction	75
Number of Weeks in a Semester	15
Department Responsible	Chemistry
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

CO-1. Explain the basic concepts of electrochemistry, conversion of chemical energy into electrical energy, theory of corrosion and principles of metal finishing
CO-2. Differentiate renewable - nonrenewable fuels, primary - secondary electrodes & primary - secondary batteries, batteries - fuel cells, electroplating – electroless plating, thermosetting – thermoplastic polymers and dry corrosion - wet corrosion
CO-3. Discuss the reaction chemistry and stoichiometry of combustion of fuels, remedial measures to control oxides of nitrogen, sulphur and carbon, polymerization – methods, mechanism, preparation, properties and applications of some polymers, concepts of nano science and nanotechnology
CO-4. Identify the types of corrosion and methods to prevent corrosion, suitable polymers and nanocomposite materials for engineering applications
CO-5. Derive kinetic rate equations for various chemical systems and equation for electromotive force
CO-6. Analyze the suitability of polymers & composites for various applications and solve problems related to storage devices, chemical kinetics, electro chemistry, corrosion

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and metal finishing

CO-7. Plan the experimental set up, conduct experiments, calculate and plot the graphs to obtain results, and write a laboratory report as per the prescribed format

4. Course Contents

Unit 1 Electrochemistry: Electrochemical cell, Electrode Potential and EMF. Construction of Galvanic cell, Types of Electrodes. Numerical on Electrode Potential of cell using Nernst equation. Construction and working of reference electrodes: calomel and silver-silver chloride electrode. Construction, working and application of Ion-selective electrode: Glass electrode. Determination of pH using glass electrode

Unit 2 Storage and Conversion devices – Batteries: Storage devices – Batteries: Primary batteries, Secondary batteries, reserve batteries and super capacitors. Construction, working and application of dry cell, lead acid, Nickel-Cadmiun, Nickel-Metal hydride, Zinc –Air, Lithium-ion batteries, Lithium polymer batteries.
Conversion devices: Fuel cells, Construction, working and application of: Hydrogen-Oxygen, Methanol-Oxygen cells.

Unit 3 Corrosion and its Control: Types of corrosion. Electrochemical theory of corrosion. Factors affecting, Corrosion control: Metal coating, cathodic protection, organic coating, corrosion-inhibitors.

Unit 4 Metal Finishing: Technological importance of metal finishing, Polarization and factors influencing polarization, Principle of electroplating, factors affecting electrodeposition, Electroplating of Chromium and Gold. Electro-less Plating of Copper and Nickel.

Unit 5 Chemical Kinetics: Order of Reactions, Derivation of second, third, consecutive reactions, rate equations, Steady State Concept, numerical problems with suitable examples of different kinds of reactions.

Unit 6 Combustion Chemistry: Introduction to Fuels, types and classification, Sources of Fuels, Characteristics of a good fuel, Proximate and ultimate analysis, Petroleum cracking, Mechanism of Knocking and its effect, Anti-knocking agents, Octane and Cetane numbers, Functioning of Catalytic converter, Introduction to Biofuels, Flue gases and control measures.

Unit 7 Polymers and polymerization: Introduction & Classification of polymers, Addition, condensation and co- ordination polymerizations, mechanism of free radical addition polymerization with ethylene as example, Techniques of polymerization (Bulk, Solution, suspension, emulsion), Tg, factors affecting Tg, effect of structure on properties of polymers, fundamentals of biodegradable polymers, preparation, properties and technical applications of thermoplastics (PVC, PVA, Teflon), thermosets (PF, UF), elastomers (natural rubber, SBR) & adhesives (epoxy and acrylics) Introduction to polymeric composites.

Unit 8 Introduction to nanoscience and nanotechnology: Basic concepts of Nanoscience and Nanotechnology – Graphene – Carbon nanotubes – Material processing by top down and down top synthesis; chemical vapor deposition and physical vapor deposition– Potential uses of nanomaterials in electronics, robotics, computers, sensors, vehicles and transportation – Medical applications of nanomaterials.

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Unit 9 – (Lab Experiments)	
1	Determination of Viscosity Coefficient of a given liquid using Ostwald's Viscometer
2	Conductometric estimation of an acid using standard NaOH solution
3	Determination of pKa of the given weak acid using Glass electrode-Ag/AgCl electrode assembly
4	Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution
5	Colorimetric estimation of Copper
6	Determination of total hardness of a given water sample
7	Determination of percentage of Cu from the given brass sample
8	Determination of percentage of Fe in the rust solution by external indicator Method
9	Determination of first order reaction constant for acid hydrolysis of ethyl acetate
10	Electroplating of copper*
11	Determination of composition of brass alloy using UV-Vis spectroscope*
12	Measurement of voltage in a hydrogen-oxygen fuel cell*
13	Preparation of printed circuit board*
14	Construction and operation of lead acid battery cell*
15	Determination of empirical formula of a fuel using exhaust gas analyzer*

* Demo experiments

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

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

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		35
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		10
1. Solving Numerical Problems	10	
Practical Work		30
1. Course Laboratory	30	
2. Computer Laboratory	00	

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3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	00
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**85**

7. Course Assessment and Reassessment

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

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (TSC1, TSC2, TSC3, LSC4 or LSC5), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation						
Course Outcome	**CE (Weightage: 50 %)**				**SEE (Weightage: 35 %)**	**Lab (Weightage: 15 %)**
	TSC1: (20 %) Midterm exam	**TSC2: (10 %) Assignment**	**TSC3: (10 %) Innovative**	**LSC4: (10 %) CE**	**Written exam**	**LSEE: SEE**
	50 marks	**25 Marks**	**25 Marks**	**25 Marks**	**100 Marks**	**25 Marks**
CO-1	▯		▯		▯	
CO-2	▯		▯		▯	
CO-3	▯		▯		▯	
CO-4	▯	▯	▯		▯	
CO-5	▯		▯		▯	
CO-6		▯			▯	
CO-7				▯		▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.						

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

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

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

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

9. Course Resources

a. Essential Reading

1. Class Notes
2. Gadag, R.V. and Nityananda Shetty A., (2010), Engineering Chemistry, Second Edition, New Delhi, I.K. International Publishing House
3. O.G. Palanna, (2011), Engineering Chemistry, New Delhi, Tata McGraw Hill Education Pvt Ltd.
4. Gurudeep Raj, (2014), Advanced Physical Chemistry, Meerut-Uttar Pradesh, Krishnan Prakashana
5. Pradeep. T, (2012) "A Text Book of Nanoscience and Nanotechnology", New Delhi, Tata McGraw Hill Company Ltd.

b. Recommended Reading

1. Pletcher, D. and Walsh, F.C., (1993), Industrial Electrochemistry, Second edition, UK, Blackie Academic and Professional
2. Kuriacose, J.C. & Rajaram, J., (1998), Chemistry in Engineering & Technology (Vol I & II), Third reprint, New Delhi, Tata McGrahill Company
3. C. N. R. Rao, Achim Muller and A.K. Cheetham, (2004), The Chemistry of Nanomaterials, Vol I & II, Weinheim, Wiley VCH.

c. Magazines and Journals

d. Websites

e. Other Electronic Resources

1. http://nptel.ac.in/
2. Electronic resources on the subject area are available on MSRUAS library

10. Course Organization

Course Code	CYB104A
Course Title	Engineering Chemistry and Laboratory
Course Leader's Name	As per Timetable

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Course Leader's Contact Details	**Phone:**	+91-804-906-5555
	E-mail:	hod.cy.mp@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date	June 2026	

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Course Specifications: Elements of Mechanical Engineering and Workshop Practice

Course Title	Elements of Mechanical Engineering and Workshop Practice
Course Code	MEF104A
Course Type	Core Theory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

This course is aimed at preparing the students to understand the concepts and underlying principles of mechanical engineering. The students are taught various types of energy sources, power generation, energy conversion methods and types of power plants. Students are taught the working of IC engines, refrigeration and air-conditioning and power transmission elements. Students are also exposed to basic operations and applications of machine tools.

2. Course Size and Credits

Number of Credits	03
Credit Structure (Lecture: Tutorial: Practical)	2:0:1
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Mechanical and Manufacturing Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

- **CO-1.** Demonstrate the understanding on Classification of energy sources, energy conversion systems, mechanical power transmission systems, machine tools and processes
- **CO-2.** Describe various energy conversion systems, mechanical power transmission systems and machine tools
- **CO-3.** Explain the working principle of refrigeration systems, biomass conversion technologies and machining operations
- **CO-4.** Solve numerical problems on IC engines and mechanical power transmission systems
- **CO-5.** Apply principles of energy conversion systems, power transmission systems, machining processes and mechanical joints to practical applications

4. Course Contents

Unit 1 (Energy Sources and its Conversion Devices): Energy sources and their classification,

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Fuels and their properties. Bio-mass energy, OTEC, Solar energy, Wind energy, Geo-thermal energy, Tidal energy, Nuclear Energy. Demonstration of Gas Turbine

Unit 2 (Boilers and Accessories): Steam boilers – classification, Lancashire boiler, Babcock and Wilcox boiler; working and function of boiler mountings and accessories. Demonstration of Steam Turbine

Unit 3 (Hydraulic Pumps and IC engines): Classification, Principles and operations of Reciprocating and rotary types of pumps and compressors.
Internal Combustion Engines: Classification of IC Engines, engines components, 2 and 4–Stroke Petrol and diesel engines, P-V diagrams for Otto and Diesel cycles, IC engine performance-numerical on IC engines, electric and Hybrid vehicles. Demonstration of Pumps, Blower Compressors and Multi-cylinder Engine.

Unit 4 (Refrigeration and Air Conditioning): Properties of refrigerants, Performance of Refrigeration System - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, Unit of Refrigeration, Energy Efficiency Ratio (EER). Principle and working of vapour compression refrigeration, vapour absorption refrigeration, comparison of vapour compression and vapour absorption refrigeration. Principles and applications of air conditioners, Room air conditioner, automotive air conditioning system

Unit 5 (Mechanical Power Transmission): Belt Drives - Classification and applications, Length of belt, Velocity ratio, Creep and slip, Idler pulley, stepped pulley and fast and loose pulley, belt and pulley construction. Demonstration of Open and Cross Belt drive. Applications of chain drive and rope drives. Gear Drives: Definitions, Terminology, types and uses, Gear Drives and Gear Trains – Simple problems on gear drives. Demonstration of Simple and Compound Gear Trains. Importance of machining and machine tools

Unit 6 (Machine Tools and Mechanical Joints): Lathe - Principle of working of a Centre Lathe, Parts of a lathe, Lathe Operations. Drilling Machine – Principle of working and classification of drilling machines, types of drilling machines, drilling operations. Demonstration of working of Lathe and drilling machines along with different operations performed. Mechanical Joints: Temporary and permanent fasteners- Threaded fasteners, Riveted joints, welded joints, Knuckle joint, cotter and pin joints, couplings. Demonstration of Fitting operations, Sheet Metal operations, Arc Welding, Fasteners and Couplings.

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

	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3												3		
CO-2	3												3		
CO-3	3												3		
CO-4		3											3		
CO-5		3											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
Face to Face Lectures		40
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		00
1. Solving Numerical Problems	00	
Practical Work		20
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	30	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**70**

7. Course Assessment and Reassessment

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

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

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			Component 2: SEE (50 % Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Mid Term	Assignment -1	Assignment -2	100 Marks
Maximum Marks ▶	50	25	25	
CO-1	▯		▯	▯
CO-2	▯	▯	▯	▯
CO-3	▯	▯	▯	▯
CO-4	▯	▯		▯
CO-5	▯	▯		▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

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

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

9. Course Resources

a. Essential Reading

1. Class Notes
2. V. K. Manglik, 2013, Elements of Mechanical Engineering, PHI Learning
3. K. R. Gopalakrishna, 2008, Elements of Mechanical Engineering, Subhash Publishers

b. Recommended Reading

1. G.D. Gokak, J.K. Kittur, 2014, Elements of Mechanical Engineering, Wiley publications
2. G. S. Sawhney, 2003, Fundamental of Mechanical Engineering, Prentice Hall of India Publication
3. S. Trymbaka Murthy, 2006, A Text Book of Elements of Mechanical Engineering, 3rd Revised Edition, I .K. International Publishing House Pvt. Ltd.
4. K. P. Roy and S. K. Hajra Chaudhary, 2005, Elements of Mechanical Engineering, Media Promoters and Publishers Pvt. Ltd.

c. Magazines and Journals

1. ASME Mechanical Engineering Magazine
2. Machine Tools

d. Websites

1. https://www.coursera.org/
2. http://nptel.ac.in/
3. www.asme.org

e. Other Electronic Resources

1. Electronic resources on the course area are available on RUAS library

10. Course Organization

Course Code	-MEF104A		
Course Title	Elements of Mechanical Engineering and Workshop Practice		
Course Leader's Name		As per Timetable	
Course Leader's Contact Details		**Phone:**	+91-804-906-5555
		E-mail:	hod.me.et@msruas.ac.in
Course Specifications Approval Date		June 2022	
Next Course Specifications Review Date		June 2026	

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Course Specifications: Elements of Electrical Engineering and Laboratory

Course Title	Elements of Electrical Engineering and Laboratory
Course Code	EEF105A
Course Type	Core Theory and Laboratory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

This course deals with basic principles and concepts of electric and magnetic circuits. Students are taught construction, principle of operation, working, characteristics of DC machines, transformers and AC rotating machines. They are introduced to fractional-kW motors, special purpose machines and facilitated to understand measuring instruments, domestic wiring and earthing techniques. Basic electrical laboratory deals with practical applications of circuits and their theoretical concepts.

2. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:0:1
Total Hours of Interaction	75
Number of Weeks in a Semester	15
Department Responsible	Electrical Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

CO-1. State and explain various laws of electric circuits, magnetic circuits and their significance, phasor diagrams for electrical elements
CO-2. Explain construction, principle of operation, working and characteristics of DC machines, transformers, AC rotating machines and their applications
CO-3. Derive equations for electrical circuits, magnetic circuits and performance of various AC and DC machines
CO-4. Solve problems on electric circuits, magnetic circuits, DC machines, transformers and AC rotating machines
CO-5. Conduct experiments as per the standard procedures and tabulate/calculate/plot the measured values
CO-6. Interpret and compare with standard results, and draw conclusions and Write report as per the prescribed format

4. Course Contents

Unit 1 (Circuit Analysis Technique-I): DC Fundamentals: Circuit elements, voltage and current division, Ohm's law and Kirchhoff's laws, mesh analysis, nodal analysis, source transformations, application of star delta transformation, Thevenin's theorem, maximum power transfer theorem, superposition theorem.

Unit 2 (Circuit Analysis Technique-II): A.C. Fundamentals: Sinusoidal voltage and currents, period, frequency, instantaneous, peak, average, r.m.s. values, peak factor and form factor, phase difference, lagging, leading and in phase quantities. Simple R, L and C circuits.

Unit 3 (Magnetic Circuits): Magnetic effect of electrical current, cross and dot convention, right hand thumb rule and cork screw rule, Fleming's right hand rule, Fleming's left hand rule, Faraday's law of electromagnetic induction, statically and dynamically induced EMF's, concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, basic analogy between electric and magnetic circuits.

Unit 4 (DC Machines): Constructional details, working principle and methods of excitation of DC machine as a generator and a motor. EMF equation of generator, relation between induced EMF and terminal voltage with brush contact drop, back EMF, torque equation of a DC motor.

Unit 5 (Transformers and AC Rotating Machines): Single Phase Transformers: Necessity of transformer, Constructional Details (core and shell types), Principle of operation, Ideal Transformer and Practical Transformer. EMF equation, Losses, Transformer Test, Circuit Model of Transformer, Determination of Parameters of Circuit Model of Transformer, Impedance shifting, Efficiency and Regulation Calculations
Three phase induction machine: Constructional details, principle of operation, slip and rotor frequency.

Unit 6 (Domestic Wiring): Domestic wiring, concealed conduit wiring, two-way and three-way control

Unit 7 (Laboratory): List of Experiments

No.	Course Content for Laboratory
1	Verification of KVL and KCL for DC circuits
2	Verification of superposition theorem
3	Verification of Thevnin's theorem
4	Verification of maximum power transfer theorem
5	Verification of mesh analysis
6	Verification of node analysis
7	Determination of relationship between phase and line voltages; Phase and line currents in a three phase system
8	Determination of efficiency of a single phase transformer
9	Analysis of load characteristics of DC shunt motor
10	Wiring of two-way and three-way switching of lamp

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

	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2				2	2			1		1	3	2	1
CO-2	3	2				2	2					1	3	2	1
CO-3	3	2	2									1	3		1
CO-4	3	3	2		2				1	1		1	3	2	1
CO-5	3	3	3	2	2	2			1	1	1	1	3	2	1

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

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		30
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		15
1. Solving Numerical Problems	30	
Practical Work		30
1. Course Laboratory	20	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**85**

7. Course Assessment and Reassessment

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

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (TSC1, TSC2, TSC3 and LSC4), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation						
Course Outcome	CE (Weightage: 50 %)				SEE (Weightage: 35 %)	Lab (Weightage: 15 %)
	TSC1: (20 %) Midterm exam	TSC2: (10 %) Assignment	TSC3: (10 %) Innovative	LSC4: (10 %) CE	Written exam	LSEE: SEE
	50 marks	25 Marks	25 Marks	25 Marks	100 Marks	25 Marks
CO-1	▯		▯		▯	
CO-2	▯	▯	▯		▯	
CO-3	▯	▯	▯		▯	
CO-4	▯	▯	▯		▯	
CO-5				▯		▯

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The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.

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

Course reassessment policies are presented in the Academic Regulations document.

8. Achieving COs

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

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

9. Course Resources

a. Essential Reading

1. Course notes
2. Edward Hughes, 2011, Electrical and Electronics Technology, 10th edition, Dorling Kindersley India Pvt. Ltd.
3. Del Toro V. 2008, Electrical Engineering Fundamentals, PHI

b. Recommended Reading

1. Mittle V. and Arvind Mittle, 2007, Basic Electrical and Electronics Engineering, Tata McGraw Hill, New Delhi
2. Delton Horn T. 1993, Basic Electricity and Electronics, McGraw-Hill Limited, Europe

c. Magazines and Journals

1. IEEE Circuits and Designs magazine

d. Websites

1. https://www.coursera.org/
2. http://nptel.ac.in/

e. Other Electronic Resources

1. MULTISIM/ PROTEUS

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10. Course Organization

Course Code	EEF105A		
Course Title	Elements of Electrical Engineering and Laboratory		
Course Leader's Name		As per Timetable	
Course Leader's Contact Details		**Phone:**	+91-804-906-5555
		E-mail:	hod.ee.et@msruas.ac.in
Course Specifications Approval Date		June 2022	
Next Course Specifications Review Date		June 2026	

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Course Specifications: Elements of Computer Science and Engineering

Course Title	Elements of Computer Science and Engineering and Laboratory
Course Code	CSF106A
Course Type	Core Theory and laboratory
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

This course is intended to provide an understanding of the elements of computer science and engineering and development of computer programs using algorithmic and programming constructs, for students across streams. Elements and methods of computer science and engineering and their applications to engineering computational problems are discussed using illustrative examples. Students are taught the methodology of solving computational problems algorithmically, programming concepts and constructs, basic algorithms and data structures. They are also exposed to the practice of software development, modern computing systems and their scope for engineering applications.

2. Course Size and Credits

Number of Credits	03
Credit Structure (Lecture: Tutorial: Practical)	3:0:1
Total Hours of Interaction	75
Number of Weeks in a Semester	15
Department Responsible	Computer Science and Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

3. Course Outcomes (COs)

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

CO-1. Describe the elements and methodology of Computer Science and Engineering
CO-2. Explain the basic principles and techniques of algorithms and programming
CO-3. Select appropriate approach to solve a computational problem
CO-4. Design an algorithmic solution and draw a flow chart of the solution
CO-5. Develop computer programs for moderately complex problems
CO-6. Test and validate developed computer programs

4. Course Contents

Unit 1 (Introduction): Computers and other computing devices, interface between Computer Science and Engineering (CSE) and other disciplines, idea of computing, nature and purpose of CSE, software and computer programs, practice of CSE. Relationship between data, information and knowledge.

Unit 2 (Problem Solving using Computers): Algorithmic problem solving. Flowcharts: symbols and meaning. Drawing flowcharts for simple problems. Fundamental algorithms, efficiency. Example of algorithms in practice: Illustration of algorithms for numerical computation, simulation and data processing in engineering domains. Lab Exercises on Problem Solving Using Computers.

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Unit 3 (Building Blocks of Computer Programs): Programming languages and process of compiling and program execution. Data representation and storage. Python programming language, IDEs and Workbooks. Data types, variables and keywords. Program structure. Simple data manipulation and logical statements, lists, tuples, sets and dictionaries, conditional and looping control statements, functions, nested expressions, recursion. Plotting and other utility libraries. Lab Exercises on Building Blocks of Computers.

Unit 4 (Elements of Computer Programming): Elements of good programming style, decomposing problems, moving from algorithm to code, random number generation, testing and validation of programs. Lab Exercises on Problem Solving Using random number generation.

Unit 5 (Basic Algorithms and Data Structures): Iterative and recursive algorithms, algorithms for search, sorting algorithms, idea of a data structure, basic data structures and algorithms, and their use. Lab Exercises on Problem Solving Using Iterative and recursive algorithms.

Unit 6 (Algorithm Design): Recursion, Brute force, Divide and conquer, Greedy approaches. Introduction to Backtracking and Dynamic programming.

Unit 7 (Modern Computing Systems): Software development process, operating systems, network of computers, distributed computing, high performance computing, Internet and Web technology, cloud computing.

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

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

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		45
Demonstrations		00
1. Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		00
1. Solving Numerical Problems	00	
Practical Work		30
1. Course Laboratory	00	
2. Computer Laboratory	30	

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3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	00
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**85**

7. Course Assessment and Reassessment

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

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

Focus of COs on each Component or Subcomponent of Evaluation						
Course Outcome	**CE (Weightage: 50 %)**				**SEE (Weightage: 35 %)**	**Lab (Weightage: 15 %)**
	TSC1: (20 %) Midterm exam	**TSC2: (10 %) Assignment -1**	**TSC3: (10 %) Assignment -2**	**LSC4: (10 %) CE**	**Written exam**	**LSEE: SEE**
	50 marks	**25 Marks**	**25 Marks**	**25 Marks**	**100 Marks**	**25 Marks**
CO-1	▯		▯		▯	
CO-2	▯	▯	▯		▯	
CO-3	▯	▯	▯		▯	
CO-4	▯	▯	▯		▯	
CO-5				▯		▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.						

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

Course reassessment policies are presented in the Academic Regulations document.

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8. Achieving Cos

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

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

9. Course Resources

a. Essential Reading

1. Class notes
2. Dromey, R. G., 1982, How to Solve It by Computer, New Delhi: Pearson Education.

b. Recommended Reading

1. Downey, A. B., 2016, Think Python: How to Think Like a Computer Scientist, O'Rielly.
2. Polya, G., 1990, How to Solve It: A New Aspect of Mathematical Method, 2nd edn. New Delhi: Penguin Books.
3. Aho, A. V., Hopcropt, J. E., and Ulman, J. D., 1974, The Design and Analysis of Computer Algorithms, New Delhi: Pearson Education.

c. Magazines and Journals

1. Quanta Magazine Computer Science Section, http://www.quantamagazine.org/ computerscience
2. Dr. Dobb's Journal, http://drdobbs.com/
3. Lifehacker, https://lifehacker.com/

d. Websites

1. Association of Computing Machinery (ACM), http://www.acm.org/
2. IEEE Computer Society, http://www.computer.org/

e. Other Electronic Resources

1. Electronic resources on the course area available on MSRUAS library

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2. Think Python online: http://openbookproject.net/thinkcs/python/english2e/

10. Course Organization

Course Code	CSF106A	
Course Title	Elements of Computer Science and Engineering	
Course Leader's Name	As per Timetable	
Course Leader's Contact Details	**Phone:**	+91-804-906-5555
	E-mail:	hod.cs.et@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date	June 2026	

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Course Specifications: Professional Communication

Course Title	Professional Communication
Course Code	TSN102A
Course Type	Ability Enhancement Compulsory Course
Department	Applicable to all Programmes
Faculty	Engineering and Technology

1. Course Summary

This course aims at equipping students with the skills required for effective communication in professional context. The students will be guided through professional practices of written and oral communication. Students will be sensitized to the importance of professional etiquette. Students will be taught to apply oral and written communication skills in a given situation.

2. Course Size and Credits

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

3. Course Outcomes (COs)

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

CO-1. Apply the concepts of grammar for communication
CO-2. Compose precise paragraphs
CO-3. Demonstrate professional etiquette
CO-4. Demonstrate appropriate verbal and non-verbal communication in the given context
CO-5. Develop professional written document

4. Course Contents

Unit 1 (Grammar for Effective Communication): Sentence formation, sentence types, different parts of speech, adjectives and articles, verbs and preposition, present and past tense, future tense, use of participles in different tenses, usage of tenses, rules of subject verb agreement, Direct and indirect sentences, usage of direct and indirect sentences

Unit 2 (Communication – Verbal: Written): Paragraph Writing: Structure of a paragraph – topic sentence, supporting sentence, conclusion sentence, functions of paragraph, paragraph patterns, paragraph writing principles – coherence, unity, order, length; Précis Writing: Paraphrasing techniques, Usage of appropriate words;

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Report Writing: Purpose of report writing, report format, use of language while report writing

Unit 3 (Communication-Nonverbal): Meaning, Nature and importance, Kinesics, Proxemics, Time, Paralanguage, Touching Behavior, Body Language, effects of nonverbal communication on verbal communication

Unit 4 (Professional Etiquette): Etiquette and its importance, types of etiquette - email etiquette, telephone etiquette, conversation; Body language in conversation, tones in conversation, conversation manners, stages of conversation – introduction, feed forward, close, order of introduction, conversation barriers

Unit 5 (Presentation): The importance of presentation skills, various stages of presentation planning – development of structure and style, interpersonal sensitivity, presentation accessories and equipment, time management during presentation, stages of presentation – introduction, body and conclusion, presentation etiquette

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

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

6. **Course Teaching and Learning Methods**

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		20
Demonstrations		0
1.Demonstration using Videos	00	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	00	
Numeracy		0
1. Solving Numerical Problems	00	
Practical Work		04
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	04	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	

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Others		06
1. Case Study Presentation	02	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	02	
5. Group Discussions	02	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**40**

7. Course Assessment and Reassessment

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

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2), COs are assessed as illustrated in the following Table.
Focus of CO's on each Component or Subcomponent of Evaluation:

Focus of COs on each Component or Subcomponent of Evaluation			
	Component 1: CE (50% Weightage)		**Component 2: SEE (50% Weightage)**
Subcomponent ▶	**SC1**	**SC2**	
Subcomponent Type ▶	**Midterm Exam**	**Assignment**	**50 Marks**
Maximum Marks ▶	**25**	**25**	
CO-1	X	X	X
CO-2			X
CO-3		X	X
CO-4	X		
CO-5	X	X	X
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.			

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

8. Achieving COs

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

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Face to face lectures
2.	Understanding	Face to face lectures, group discussions
3.	Critical Skills	--
4.	Analytical Skills	Face to face lectures, activities, , group discussions, assignment
5.	Problem Solving Skills	--

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6.	Practical Skills	Face to face lectures, activities, , group discussions, course work
7.	Group Work	Course work, practice, assignment, group discussion
8.	Self-Learning	Course work, practice, assignment, group discussion
9.	Written Communication Skills	Face to face lectures, Course work, practice, assignment, group discussion
10.	Verbal Communication Skills	Face to face lectures, Course work, practice, assignment, group discussion
11.	Presentation Skills	--
12.	Behavioral Skills	Course work, practice, assignment, group discussion, presentation practice, role plays
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

9. Course Resources

a. Essential Reading

1. Class Notes
2. Raman M and Sharma S (2004) Technical Communication: Principles and Practice. New Delhi: Oxford University Press
3. Hory Sankar Mukherjee, (2013), Business Communication, Oxford University Press
4. Kroehnert, Gary (2004), Basic Presentation Skills, Tata McGraw Hill

b. Recommended Reading

1. Sathya Swaroop Debashish and Bhagaban Das, (2014), Business Communication, PHI, New Delhi
2. Young, Dona J (2006) Foundations of Business Communications:
3. An Integrated Approach, Tata McGraw Hill
4. Kaul, Asha (2007) Effective Business Communication, Prentice Hall India
5. Bienvenu, Sherron (2008) The Presentation Skills Workshop, Prentice Hall
6. KavitaTyagi and Padma Misra (2011) Professional Communication, PHI Learning Private Limited, New Delhi

c. Magazines and Journals

d. Websites

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

e. Other Electronic Resources

1. Electronic resources on the course area are available on RUAS library

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10. Course Organization

Course Code	TSN102A	
Course Title	Professional Communication	
Course Leader's Name	As per Timetable	
Course Leader's Contact Details	**Phone:**	+91-80-453666666
	E-mail:	director.tsld@msruas.ac.in
Course Specifications Approval Date	June 2022	
Next Course Specifications Review Date	June 2026	

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Course Specifications: Engineering Mathematics - 3

Course Title	Engineering Mathematics - 3
Course Code	MTB201A
Course Type	Core Theory
Department	Mathematics and Statistics
Faculty	Engineering and Technology

21. Course Summary

This course deals with vector calculus, Fourier transform techniques in the context of engineering problems. The rudimentary principles and important theorems in vector calculus are taught in this course. The assumptions, principles and distinguishing features of Fourier series, Fourier transform and vector calculus are emphasized. This course also covers the underlying principles and applications of Fourier series and Fourier transform techniques in various engineering disciplines. This course also aims at solving engineering problems associated with Fourier series, Interpolation and numerical integration using MATLAB.

22. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	3:1:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Mathematics and Statistics
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

23. Course Outcomes (COs)

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

- **CO-11.** State and explain the important theorems in Fourier series, Fourier transform and vector integral calculus
- **CO-12.** Solve simple problems in Fourier series, Fourier transform and vector integral calculus
- **CO-13.** Apply Fourier series, Fourier transform and vector integral calculus in solving complex real world engineering problems
- **CO-14.** Implement the programs to solve system of linear equations and non-linear equations of single variable using MATLAB.
- **CO-15.** Apply interpolation and curve fitting by least square method using MATLAB in analyzing some real world problems

24. Course Contents

Unit 1 (Fourier Series): Periodic functions, Dirichlet's conditions for convergence of Fourier series, Fourier series for a periodic function of period T, half range Fourier series, complex Fourier series.

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Unit 2 (Fourier transform): Definition, Fourier transform of elementary functions, properties. Inverse Fourier transform, solution of initial value problems.

Unit 3 (Vector calculus): Review of vector algebra, vector and scalar fields, derivatives of vector valued functions, curves, tangents, arc length. Gradient of a scalar field, directional derivatives, divergence and curl of a vector field. Polar, Cylindrical and Spherical coordinates systems. Line integral, double integral, change of order, Jacobian, change of variables, and triple integral. Green's theorem, Stokes' theorem, Gauss divergence theorem.

Unit 4 (MATLAB): Introduction to MATLAB, Basic algebraic and matrix operations, built-in and command line functions. Plots Scripts and functions. Newton-Raphson method and Numerical solution of system of linear equations by Gauss-Seidel method. Fourier series for discrete data points. Interpolation - Lagrange interpolation, Newton's divided difference interpolation. Newton-Cotes' quadrature, trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules, and Gaussian quadrature.

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

	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	3	2							1			1	1	
CO-2	3	3	1							1			1	1	
CO-3	3	3	2	3						2			1	2	
CO-4	3	3	2	2						2			1	2	
CO-5	3	3	2	2						2			1	1	
			The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.												

26. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	02	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	03	
Numeracy		15
1. Solving Numerical Problems	15	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	

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3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**70**

27. Course Assessment and Reassessment

The components and subcomponents of course assessment are presented in the Academic Regulations document pertaining to the B. Tech. 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.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			**Component 2: SEE (50% Weightage)**
Subcomponent ▶	**SC1**	**SC2**	**SC3**	
Subcomponent Type ▶	**Midterm exam**	**Assignment -1**	**Assignment -2**	**100 Marks**
Maximum Marks ▶	**50**	**25**	**25**	
CO-1	▯			▯
CO-2	▯			▯
CO-3	▯			▯
CO-4		▯	▯	▯
CO-5		▯	▯	
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

Course reassessment policies are also presented in the Academic Regulations document.

28. Achieving COs

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

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

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

29. Course Resources

k. Essential Reading

3. GlynJames,2016, Advanced Modern Engineering Mathematics, 4th edition, Pearson
4. Richard Burden and Douglas Faires, 2017, Numerical Analysis, 9th edition, Massachusetts, Brooks/Cole

l. Recommended Reading

1. Erwin Kreyszig, 2015, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons Inc
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, 2008, Numerical Methods, New Delhi, New Age
3. L. Chanparro, 2010, Signals and Systems using MATLAB, Academic Press
4. S.D. Stearns and D. R. Hush, 2011, Digital Signal Processing with Examples in MATLAB, CRC Press

m. Magazines and Journals

n. Websites

1. http://nptel.ac.in/
2. https://ocw.mit.edu/index.htm

o. Other Electronic Resources

1. https://www.khanacademy.org/
2. tutorial.math.lamar.edu/

30. Course Organization

Course Code	MTB201A		
Course Title	Engineering Mathematics - 3		
Course Leader Name		As per Timetable	
Course Leader Contact Details		**Phone:**	080 4906 5555
		E-mail:	hod.mt.mp@msruas.ac.in
Course Specifications Approval Date		June 2022	
Next Course Specifications Review Date		June 2026	

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Course Specifications: Mechanics of Solids

Course Title	Mechanics of Solids
Course Code	CEC202A
Course Type	Core Theory
Department	Civil Engineering
Faculty	Engineering and Technology

31. Course Summary

This course deals with the concepts and principles of strength of materials to enable the students to analyze the behavior of deformable structural elements, subjected to different types of loadings. Students are taught the concepts of stress, strain, deformation and their applications in solving general engineering problems. Students are trained to analyze the response of the simple structural components and determinate structures to applied forces and boundary conditions.

32. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture:Tutorial:Practical)	2:2:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Civil Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

33. Course Outcomes (COs)

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

CO-16. Describe the basic concepts of the stresses and strains for different materials and strength of structural elements

CO-17. Explain stress strain behaviour of materials, axial forces, bending, torsion, shear force, bending moment, principal stresses and strains, shear force diagram, bending moment diagram and thin vessels.

CO-18. Determine shear force and bending moment, bending and shear stress distribution, principal stresses and planes, and strain energy

CO-19. Calculate load carrying capacity of members subjected to bending/shear/torsion/axial force analytically

CO-20. Analyse and design members subjected to combined bending, torsion and axial forces.

34. Course Contents

Unit 1 (Simple Stresses and Strain): Introduction, definition and concept of stress and strain; Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety;
Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self-weight, traction and point loads. Saint Venant's principle; Assembly and thermal stresses: Composite bars in tension and compression, coefficient of thermal expansion, thermal strain, thermal stress, temperature stresses in composite rods. Statically indeterminate structural problems; Elastic

constants and their relationship; Strain Energy: Strain energy in tension - compression and shear - resilience -stresses due to gradual, impact and suddenly applied load.

Unit 2 (Compound Stresses): Stress on inclined planes for axial and biaxial stress fields, transformation of plane stress, principal stresses and principal planes- Mohr's circle of stress.
Transformation of plane strain, principal strains and principal axes of strain; Mohr's circle for stresses; Strain rosettes, determination of principal strains from strain measurements, calculation of principal stresses from principal strains.

Unit 3 (Shear Force and Bending Moment in Beams): Introduction to types of beams, supports and loadings; Definition of bending moment and shear force, Sign conventions; Relationship between load intensity, bending moment and shear force; Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.

Unit 4 (Bending and Shear Stresses in Beams): Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear centre(only concept)

Unit 5 (Torsion): Torsion of circular shafts and helical springs, strength of solid and hollow circular shafts, power transmission, strain energy in shear and torsion, design of circular members in torsion, close coiled and open coiled helical springs

Unit 6 (Columns and Struts): Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

Unit 7 (Thin and Thick Cylinders): Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution.

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

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

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36. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1.Demonstration usingVideos	02	
2. Demonstration using PhysicalModels / Systems	00	
3. Demonstration on a Computer	03	
Numeracy		15
1. Solving Numerical Problems	30	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests,Laboratory Examination/Written Examination,Presentations		10
Total Duration in Hours		**70**

37. Course Assessment and Reassessment

The components and subcomponents of course assessment are presented in the Academic Regulations document pertaining to the B. Tech. 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.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			**Component 2: SEE (50% Weightage)**
Subcomponent ▶	**SC1**	**SC2**	**SC3**	
Subcomponent Type ▶	**Midterm exam**	**Assignment -1**	**Assignment -2**	**100 Marks**
Maximum Marks ▶	**50**	**25**	**25**	
CO-1	▯	▯		▯
CO-2	▯	▯		▯
CO-3	▯	▯		▯
CO-4			▯	▯
CO-5			▯	▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

Course reassessment policies are also presented in the Academic Regulations document.

38. Achieving COs

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

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

39. Course Resources

1. Essential Reading

1. Class Notes
2. Bhavikatti S.S., 2010, Strength of materials, Oxford University Press, Edition
3. Subramanyam , 2008, Strength of Materials, Oxford University Press, Edition

2. Recommended Reading

1. Rajput, R.K., 1996, Strength of Materials, New Delhi, S. Chand & Co,
2. Punmia B.C., Ashok Jain and Arun Jain, 2000, Mechanics of Materials, New Delhi, Lakshmi Publications,
3. Hibbeller R C, Mechanics of materials, NewYork, Prentice Hall.

3. Magazines and Journals

4. Websites

5. Other Electronic Resources

1. https:// nptel.ac.in/

40. Course Organization

Course Code	CEC202A		
Course Title	Mechanics of Solids		
Course Leader Name		As per Timetable	
Course Leader Contact Details		**Phone:**	+91-804-906-5555
		E-mail:	hod.ce.et@msruas.ac.in
Course Specifications Approval Date		June 2022	
Next Course Specifications Review Date		June 2026	

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Course Specifications: Mechanics of Fluids

Course Title	Mechanics of Fluids
Course Code	CEC203A
Course Type	Core Theory Course
Department	Civil Engineering
Faculty	Engineering and Technology

41. Course Summary

This course deals with the fundamentals of Fluid Mechanics. Students are taught the properties of fluids, principles and applications of Fluid statics, dynamics and kinematics. They are also taught to solve basic hydrostatic problems involving manometers and submerged surfaces. In addition, they are trained on the computation of frictional losses in fluid flows, velocity and discharge measurement in closed conduits and open channel flow.

42. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	70
Number of Weeks in a Semester	15
Department Responsible	Civil Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

43. Course Outcomes (COs)

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

1. State and justify important laws of fluid mechanics like Hydrostatic law, Pascal's law, Continuity Equations, Bernoulli's Theorem, Darcy's Law and explain different fluid flows and the dynamics involved
2. Discuss and estimate the parameters related to physical properties and characteristic behaviour of fluids, open and closed conduit flows along with their losses
3. Determine hydrostatic pressure at any depth on any immersed surface in a fluid or fluid combinations
4. Solve fluid flow problems like flow through ducts, venturimeter ,orifices, open channel and closed conduit flows .
5. Predict the discharge across open channels using weirs, notches and flumes

44. Course Contents

Unit 1 (Fundamental concepts and over view): Fluid definition and continuum concept, Properties of Fluid: Mass density, specific weight, specific gravity, specific volume, viscosity, surface tension, & capillarity. Newton's law of viscosity . Capillary rise in a vertical tube and between two plane surfaces (Theory & Problems).

Unit 2 (Hydrostatics): Definition of fluid pressure, Pascal's law, variation of pressure with depth. Types of pressure, vapor pressure, measurement of pressure using a simple, differential & inclined manometers (Theory & problems). Introduction to mechanical and electronic pressure measuring devices

Unit 3 (Hydrostatic Pressure on surfaces): Basic definitions, equations for hydrostatic force and depth of Centre of pressure for vertical and inclined submerged laminae (plane and curved), Problems.

Unit 4 (Kinematics of Fluid Flow): Introduction, methods of describing fluid motion, definitions of types of fluid flow and flow pattern, streamline, path line, stream tube. Three dimensional continuity equation in Cartesian coordinates (derivation and problems). General continuity equation problems. Velocity potential, stream function, equipotential line, streamline- problems, Physical concepts of stream function, introduction to flow net

Unit 5 (Dynamics of fluid flow): Introduction, energy possessed by a fluid body. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Problems on applications of Bernoulli's equation (with and without losses). Introduction to kinetic energy correction factor, momentum equation problems on pipe bends

Unit 6 (Pipe Flow): Introduction, losses in pipe flow, Darcy-Weisbach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe-problems. Minor losses in pipe flow, equation for head loss due to sudden expansion- problems. Water hammer in pipes, equation for pressure rise due to gradual valve closure & sudden closure for rigid and elastic pipes.

Unit 7 (Stream Gauging): Introduction, measurement of depth, point & hook gauges, self-recording gauges. Staff gauge, weight gauge, float gauge. Measurement of velocity- single and double gauges, pitot tube, current meter, problems. Discharge Measurements-1: Introduction, venturimeter, orifice meter, rotometer, Ogee weir, broad crested weir, narrow crested weir, problems
Discharge measurements-2:
Venturiflume, triangular notch, rectangular notch, cipolletti notch, small orifices, problems.

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

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

46. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	02	

2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	03	
Numeracy		15
1. Solving Numerical Problems	30	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**70**

47. Course Assessment and Reassessment

The components and subcomponents of course assessment are presented in the Academic Regulations document pertaining to the B. Tech. 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.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			**Component 2: SEE (50% Weightage)**
Subcomponent ▶	**SC1**	**SC2**	**SC3**	
Subcomponent Type ▶	**Midterm exam**	**Assignment -1**	**Assignment -2**	**100 Marks**
Maximum Marks ▶	**50**	**25**	**25**	
CO-1	▯	▯		▯
CO-2	▯	▯		▯
CO-3	▯	▯		▯
CO-4			▯	▯
CO-5			▯	▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

he Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of course outcomes in each component assessed in the above template at the

beginning of the semester.

Course reassessment policies are also presented in the Academic Regulations document.

48. Achieving COs

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

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

49. Course Resources

6. Essential Reading

1. R.K. Rajput, 2016, A Text Book of Fluid mechanics & Hydraulic Machines, New Delhi, Chand & Co.
2. P.N.Modi and S.M.Seth,2019, Hydraulics and Fluid Mechanics Including Hydraulics Machines, New Delhi, Standard Book House
3. Narayana Pillai, 2009, Principles of Fluid Mechanics and Fluid Machines, Hyderabad, Universities Press (India).
4. Madan Mohan Das, 2009, Fluid Mechanics and Turbo machines, New Delhi, PHI Learning Pvt. Limited
5. Bansal, R. K., 2018, Textbook of fluid mechanics and hydraulic machine, New Delhi, Laxmi Publication.

7. Recommended Reading

11. Bruce R Munson, Donald F. Young, Theodore H. Okiishi, 2009, Fundamentals of Fluid Mechanics, Wiley India, New Delhi
12. Edward J. Shaughnessy, 2005, Jr.Iram Katz, James P Schaffer, Introduction to Fluid Mechanics, Oxford

8. Magazines and Journals

3. Journal of Fluid Mechanics

9. **Websites**
    5. http://nptel.ac.in/
    6. www.learnfluidmechanics.org
    7. www.efluids.com
10. **Other Electronic Resources**

50. Course Organization

Course Code	CEC203A		
Course Title	Mechanics of Fluids		
Course Leader's Name		As per Timetable	
Course Leader's Contact Details		**Phone:**	+91-804-906-5555
		E-mail:	hod.ce.et@msruas.ac.in
Course Specifications Approval Date		June 2022	
Next Course Specifications Review Date		June 2026	

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Course Specifications: Engineering Survey

Course Title	Engineering Survey
Course Code	CEC204A
Course Type	Core Theory
Department	Civil Engineering
Faculty	Engineering and Technology

51. Course Summary

This course deals with various types of surveys undertaken on field, their methods and principles. Students will be introduced to surveying instruments such as compass, plane table and theodolite and their working principles. Students are taught leveling and its applications, contouring and tachometric surveying. Students will be trained to determine and report distances, angles, directions, locations, elevation, areas and volume data from field survey.

52. Course Size and Credits:

Number of Credits	04
Credit Structure (Lecture: Tutorial: Practical)	4:0:0
Total Hours of Interaction	60
Number of Weeks in a Semester	15
Department Responsible	Civil Engineering
Total Course Marks	100
Pass Criterion	As per the Academic Regulations
Attendance Requirement	As per the Academic Regulations

53. Course Outcomes (COs)

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

- **CO-21.** Measure distance between two stations, procedure to set out perpendiculars at various points on a given line and polygons using tapes and chains and other accessories
- **CO-22.** Develop and plot the various features on the ground using various methods of plane table surveying
- **CO-23.** Determine the elevations using various methods and also identify a suitable method for a given case
- **CO-24.** Determine horizontal and vertical angles by different methods, heights and distances, closing errors in traversing, areas and volume
- **CO-25.** Determine tacheometric constant, measure elevation, horizontal distance and gradient between given points
- **CO-26.** Setting out simple curves by suitable methods

54. Course Contents

Unit 1 (Introduction) : Definition, principles of surveying, scales, types of surveying. Field and office work, conventional signs, equipment's, their care and adjustment. Chains, tapes, arrows, ranging rods-ranging and chaining, reciprocal ranging - overcoming obstacles in chaining - chaining on a sloping ground, hypotenuse allowance, setting perpendiculars, traversing, plotting, enlarging and reducing figures

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Unit 2 (Compass Surveying): Meridians and bearings, principles, working, prismatic compass and surveyor's compass - magnetic and true bearings, WCB and reduced bearings - errors in compass surveying, Local attraction, determination and corrections. Dependent and independent coordinates, magnetic declination, dip. Traversing, plotting, traverse adjustment, checks for closed traverse and determination of closing error and its direction. Bowditch's rule and transit rule, Bowditch's graphical method of adjustment of closed traverse, omitted measurements, area computation, Simpson's rule and trapezoidal rule-area from latitude and departure -volumes - trapezoidal and prismoidal formula

Unit 3 (Minor Instruments): Box sexant, planimeter, pentagraph, inclinometer, clinometer, ceylon ghat tracer, hand level and pantagraph. Plane Table Surveying: Plane table instruments and accessories, merits and demerits. Orientation- methods of orientation, Methods of plotting- radiation, intersection, traverse and resection. Three point and two point problems, solution to three point problem Bessel's graphical method - solution to two point problem by graphical method, errors in plane table survey.

Unit 4 (Leveling and its Applications): Level line, horizontal line, levels and staff, spirit level. Sensitiveness, benchmarks, temporary and permanent adjustments. Differential leveling, Fly leveling, profile leveling, block leveling, booking, reduction of levels, checks, curvature and refraction, reciprocal leveling, longitudinal and cross sectioning. Plotting, calculation of areas and volumes.

Unit 5 (Contouring): characteristics and uses of contours, methods of contouring, direct and indirect methods, uses of contours. Numerical problems on determining intervisibility, grade contours and uses, plotting, earthwork volume, capacity of reservoirs, automatic levels.

Unit 6 (Theodolite Surveying): Vernier and microptic theodolite, description, temporary and permanent adjustments. Two face observation, necessity, measurements of horizontal angles by repetition and Reiteration, measurements of vertical angles and magnetic bearing. Prolonging a line, lining in and setting out an angle with a theodolite, heights and distances, traversing, computation of consecutive and independent co-ordinates, area calculation by independent co-ordinates. Omitted measurements, compensating and cumulative errors, elimination of errors, and adjustment of closed traverse by transit rule and Bowditch's rule, Gale's traverse table.Open traverse and its uses, measurement of deflection angles using transit theodolite, open traverse survey, checks in open traverse

Unit 7 (Tacheometry): Introduction, basic definitions, fundamental principles, tachometric systems. Trigonometric Leveling: Introduction, basic definitions, fundamental principles. Curve Setting: Curves - necessity & types. Simple curves- Elements, designation of curves, setting out simple curves by linear method, setting out curves by Rankine's deflection angle method. Compound curves- Elements, design of compound curves, setting out of compound curves, reverse curve between two parallel straights (equal radius and unequal radius). Transition curves- characteristics, length of transition curve and Bernoulli's lemniscates; vertical curves- types, simple numerical problems.

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

	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2											3		
CO-2	3	2	1										3		
CO-3	3	3	2										3		
CO-4	3	3	2										3		
CO-5	3	1											3		
CO-6	3	2	2										3		
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.															

56. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		40
Demonstrations		05
1. Demonstration using Videos	02	
2. Demonstration using Physical Models / Systems	00	
3. Demonstration on a Computer	03	
Numeracy		15
1. Solving Numerical Problems	30	
Practical Work		00
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop / Kitchen	00	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
Others		00
1. Case Study Presentation	00	
2. Guest Lecture	00	
3. Industry / Field Visit	00	
4. Brain Storming Sessions	00	
5. Group Discussions	00	
6. Discussing Possible Innovations	00	
Term Tests, Laboratory Examination/Written Examination, Presentations		10
Total Duration in Hours		**70**

57. Course Assessment and Reassessment

The components and subcomponents of course assessment are presented in the Academic Regulations document pertaining to the B. Tech. 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.

Focus of COs on each Component or Subcomponent of Evaluation				
	Component 1: CE (50% Weightage)			Component 2: SEE (50% Weightage)
Subcomponent ▶	SC1	SC2	SC3	
Subcomponent Type ▶	Midterm exam	Assignment -1	Assignment -2	100 Marks
Maximum Marks ▶	50	25	25	
CO-1	▯	▯	▯	▯
CO-2	▯	▯	▯	▯
CO-3	▯	▯	▯	▯
CO-4	▯	▯	▯	▯
CO-5		▯		▯
CO-6		▯		▯
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.				

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

Course reassessment policies are also presented in the Academic Regulations document.

58. Achieving COs

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

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

59. Course Resources

p. Essential Reading

1. Class Notes