

**SRI SHANMUGHA COLLEGE OF ENGINEERING AND
TECHNOLOGY**

(An Autonomous Institution)

Pullipalayam, Morur (Po.), Sankari (Tk.),
Salem (Dt.) - 637 304.

**B.E.
MECHANICAL ENGINEERING**

CURRICULUM

CHOICE BASED CREDIT SYSTEM

REGULATIONS 2023



SRI SHANMUGHA COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

Approved by AICTE, Affiliated to Anna University,
Accredited by NAAC, NBA (ECE/CSE/MECH) and ISO 9001:2015 Certified
Pullipalayam, Sankari, Salem (Dt.)

CURRICULUM AND SYLLABI

CHOICE BASED CREDIT SYSTEM

B.E. MECHANICAL ENGINEERING



REGULATION 2023


CHAIRMAN-BOARD OF STUDIES

Institute vision:

To be an institute of repute in all fields of education by implementing the best practices akin to global standards for fostering domain knowledge and developing research attitude among students to make them globally competent.

Institute Mission:

- Achieving excellence in Teaching & Learning process using state-of-the-art resources.
- Extending opportunity to upgrade faculty knowledge and skills.
- Implementing the best student training practices for requirements of industrial scenario of the state.
- Motivating faculty and students in research activity for real time application

Department of Mechanical Engineering

Vision

To prepare competent mechanical engineers capable of working in an interdisciplinary environment contributing to society through innovation, leadership and entrepreneurship.

Mission

- M1** To offer quality education which enables them in professional practice and career.
- M2** To provide learning opportunities in the state-of-the-art research facilities to create, interpret, apply and disseminate knowledge in their profession.
- M3** To prepare the students as professional engineers in the society with an awareness of environmental and ethical values.

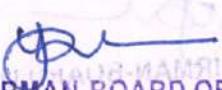
Program Educational Outcomes (PEOs)

- PEO 1.** To prepare students to take up career in Industry, Academia as well as in Public service
- PEO 2.** To provide core domain and interpersonal skills to design & develop mechanical systems for interdisciplinary applications following ethical code
- PEO 3.** To develop qualities to progress in entrepreneurship and research activities


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PROGRAM OUTCOMES (POs)

- PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.


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Program Specific Outcomes (PSOs)**PSO1- Modelling, Simulation and Analysis in the field of Manufacturing****PSO2- Develop and implement new ideas on product design with help of modern CAD tools**


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B.E. MECHANICAL ENGINEERING

REGULATION – 2023
CHOICE BASED CREDIT SYSTEM
CURRICULUM



I SEMESTER									
Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
Theory Course(s)									
23EN101	Communicative English	HSMC	3	0	0	3	40	60	100
23MA201	Engineering Mathematics -I	BSC	3	1	0	4	40	60	100
23PH201	Physics for engineers	BSC	3	0	0	3	40	60	100
23CY201	Chemistry for engineers	BSC	3	0	0	3	40	60	100
23CS301	Problem Solving and Python Programming	ESC	3	0	0	3	40	60	100
23TA101	Heritage of Tamils/தமிழர் மரபு	HSMC	1	0	0	1	100	-	100
Practical Course(s)									
23PC201	Physics and Chemistry Laboratory	BSC	0	0	4	2	60	40	100
23CS302	Problem Solving and Python Programming Laboratory	ESC	0	0	4	2	60	40	100
23EN102	Communication Laboratory	HSMC	0	0	2	1	60	40	100
Mandatory Course									
23MC801	Induction Programme	MC	2 Weeks			0	100	-	100
TOTAL				16	1	10	22	580	420
				1000					


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II SEMESTER										
Code No.	Course	Category	Periods / Week			C	Maximum Marks			
			L	T	P		CIA	ESE	Total	
Theory Course(s)										
23MA202	Engineering Mathematics-II	BSC	3	1	0	4	40	60	100	
23ME301	Engineering Graphics	ESC	3	1	0	4	40	60	100	
23EC301	Basics of Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100	
23TA102	Tamils and Technology/தமிழரும் தொழில்நுட்பமும்	HSMC	1	0	0	1	100	-	100	
Theory with Practical Course(s)										
23IT301	Programming in C	ESC	3	0	2	4	50	50	100	
Practical Course(s)										
23ME302	Engineering Practices Laboratory	ESC	0	0	4	2	60	40	100	
Employability Enhancement Course(s)										
23ME701	Design Thinking	EEC	2	0	0	2	40	60	100	
Total			15	2	8	20	370	330	700	

III SEMESTER										
Code No.	Course	Category	Periods / Week			C	Maximum Marks			
			L	T	P		CIA	ESE	Total	
Theory Course(s)										
23MA204	Engineering Mathematics-III	BSC	3	1	0	4	40	60	100	
23ME401	Engineering Thermodynamics	PCC	3	0	0	3	40	60	100	
23ME303	Engineering Mechanics	ESC	3	0	0	3	40	60	100	
23ME402	Engineering Materials and Metallurgy	PCC	3	0	0	3	40	60	100	
23ME403	Manufacturing Processes	PCC	3	0	0	3	40	60	100	
Theory with Practical Course(s)										
23ME404	Fluid Mechanics and Machinery	PCC	3	0	2	4	50	50	100	
Practical Course(s)										
23ME405	Computer Aided Design (CAD) Laboratory	PCC	0	0	4	2	60	40	100	

Employability Enhancement Course(s)									
23HS701	Soft skills-I	EEC	1	0	0	1	100	-	100
	TOTAL		19	1	6	23	410	390	800

IV SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
Theory Course(s)									
23MA206	Statistics and Numerical Methods	BSC	3	1	0	4	40	60	100
23ME406	Theory of Machines	PCC	3	0	0	3	40	60	100
23ME407	Thermal Engineering	PCC	3	0	0	3	40	60	100
23ME408	Strength of Materials	PCC	3	0	0	3	40	60	100
23HS101	Universal Human Values-II	HSMC	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23ME409	Manufacturing Technology	PCC	3	0	2	4	50	50	100
Practical Course(s)									
23ME410	Strength of Materials Laboratory	PCC	0	0	2	1	60	40	100
23ME411	Thermal Engineering Laboratory	PCC	0	0	4	2	60	40	100
Employability Enhancement Course(s)									
23HS702	Soft skills-II	EEC	1	0	0	1	100	-	100
Mandatory Course									
23MC802	Environmental Sciences and Disaster Management	MC	2	0	0	0	100	-	100
	Total		21	1	8	24	570	430	1000

V SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
Theory Course(s)									
23ME412	Design of Machine Elements	PCC	3	0	0	3	40	60	100
23ME413	Metrology and Measurements	PCC	3	0	0	3	40	60	100

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23ME414	Hydraulics and Pneumatics	PCC	3	0	0	3	40	60	100
23MEXXX	Professional Elective-I	PEC	3	0	0	3	40	60	100
23MEXXX	Professional Elective-II	PEC	3	0	0	3	40	60	100
23XXXXX	Open Elective*-I	OEC	3	0	0	3	40	60	100

Practical Course(s)

23ME415	Metrology and Dynamics Laboratory	PCC	0	0	4	2	60	40	100
23ME416	CAM Laboratory	PCC	0	0	4	2	60	40	100

Employability Enhancement Course(s)

23HS703	Soft skills-III	EEC	1	0	0	1	100	-	100
TOTAL			19	0	6	23	460	440	900

*Open Elective - Shall be chosen from the list of open electives offered by other Programs

VI SEMESTER

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
Theory Course(s)									
23ME417	Heat and Mass Transfer	PCC	3	1	0	4	40	60	100
23ME418	Design of Transmission Systems	PCC	3	0	0	3	40	60	100
23BM419	Internet of Things for Mechanical Engineers	PCC	3	0	0	3	40	60	100
23ME504	Professional Elective-III	PEC	3	0	0	3	40	60	100
23XXXXX	Open Elective*-II	OEC	3	0	0	3	40	60	100
23XXXXX	Open Elective*-III	OEC	3	0	0	3	40	60	100
Practical Course(s)									
23ME419	Heat Transfer Laboratory	PCC	0	0	4	2	60	40	100
Employability Enhancement Course(s)									
23ME701	Mini Project	EEC	0	0	4	2	100	-	100
23HS704	Soft skills-IV	EEC	1	0	0	1	100	-	100
Mandatory Course									

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23MC803	Cyber security	MC	2	0	0	0	100	-	100
	Total		21	1	6	24	600	400	1000

VII SEMESTER

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
Theory Course(s)									
23HS103	Entrepreneurship and IPR	HSMC	3	0	0	3	40	60	100
23ME420	Automobile Engineering	PCC	3	0	0	3	40	60	100
23ME421	Mechatronics	PCC	3	0	0	3	40	60	100
23MEXXX	Professional Elective-IV	PEC	3	0	0	3	40	60	100
23MEXXX	Professional Elective-V	PEC	3	0	0	3	40	60	100
23XXXXX	Open Elective*-IV	OEC	3	0	0	3	40	60	100
Practical Course(s)									
23ME422	Mechatronics Laboratory	PCC	0	0	4	2	60	40	100
Employability Enhancement Course(s)									
23ME702	Internship	EEC	0	0	0	1	100	-	100
Mandatory Course									
23MC804	Indian Constitution	MC	1	0	0	0	100	-	100
	TOTAL		19	0	4	21	500	400	900

VIII SEMESTER

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
Employability Enhancement Course(s)									


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23ME703	Project Work	EEC	0	0	20	10	60	40	100
	TOTAL		0	0	20	10	60	40	100

Total Credits: 167**PROFESSIONAL ELECTIVES****Vertical – I DESIGN ENGINEERING**

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23ME511	Concepts of Engineering Design	PEC	3	0	0	3	40	60	100
23ME512	Computer Aided Design	PEC	3	0	0	3	40	60	100
23ME513	Product Development and Reverse Engineering	PEC	3	0	0	3	40	60	100
23ME514	Design for Manufacture and Assembly	PEC	3	0	0	3	40	60	100
23ME515	Design of Jigs, Fixtures and Press Tools	PEC	3	0	0	3	40	60	100
23ME516	Engineering Tribology	PEC	3	0	0	3	40	60	100
23ME517	Vibration and Noise Engineering	PEC	3	0	0	3	40	60	100

Vertical – II MANUFACTURING

23ME521	Additive Manufacturing	PEC	3	0	0	3	40	60	100
23ME522	Computer Integrated Manufacturing	PEC	3	0	0	3	40	60	100
23ME523	Advanced Casting and forming Processes	PEC	3	0	0	3	40	60	100
23ME524	Non Destructive Testing and Evaluation	PEC	3	0	0	3	40	60	100
23ME525	Non-Traditional Machining Processes	PEC	3	0	0	3	40	60	100
23ME526	Process Planning and Cost Estimation	PEC	3	0	0	3	40	60	100
23ME527	Composite materials	PEC	3	0	0	3	40	60	100

Vertical – III THERMAL ENGINEERING

23ME531	Power plant Engineering	PEC	3	0	0	3	40	60	100
23ME532	Refrigeration and Air Conditioning	PEC	3	0	0	3	40	60	100
23ME533	Gas Dynamics and Jet Propulsion	PEC	3	0	0	3	40	60	100

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23ME534	Advanced IC Engines	PEC	3	0	0	3	40	60	100
23ME535	Computational Fluid Dynamics	PEC	3	0	0	3	40	60	100
23ME536	Renewable Energy Technologies	PEC	3	0	0	3	40	60	100
23ME537	Design of Heating Ventilation and Air Conditioning	PEC	3	0	0	3	40	60	100

Vertical – IV ROBOTICS AND AUTOMATION

23ME541	Industrial Automation	PEC	3	0	0	3	40	60	100
23ME542	Sensors and Transducer	PEC	3	0	0	3	40	60	100
23ME543	Embedded Systems and Programming	PEC	3	0	0	3	40	60	100
23ME544	Robotics	PEC	3	0	0	3	40	60	100
23ME545	Industry 4.0	PEC	3	0	0	3	40	60	100
23ME546	Artificial Intelligence for mechanical systems	PEC	3	0	0	3	40	60	100
23ME547	Machine Learning in Automation	PEC	3	0	0	3	40	60	100

Vertical –V AUTOMOTIVE ENGINEERING

23ME551	Automotive Engine and Subsystems	PEC	3	0	0	3	40	60	100
23ME552	Automotive Electronic Systems	PEC	3	0	0	3	40	60	100
23ME553	Electric and Hybrid Vehicle Systems	PEC	3	0	0	3	40	60	100
23ME554	Vehicle Dynamics and control	PEC	3	0	0	3	40	60	100
23ME555	Intelligent Vehicle System	PEC	3	0	0	3	40	60	100
23ME556	Vehicle Maintenance	PEC	3	0	0	3	40	60	100

Vertical –VI INDUSTRIAL ENGINEERING

23ME561	Operations Research	PEC	3	0	0	3	40	60	100
23ME562	Total Quality Management	PEC	3	0	0	3	40	60	100
23ME563	Supply chain management	PEC	3	0	0	3	40	60	100
23ME564	Lean Manufacturing	PEC	3	0	0	3	40	60	100
23ME565	Engineering Economics	PEC	3	0	0	3	40	60	100
23ME566	Enterprise Resource Planning	PEC	3	0	0	3	40	60	100

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23ME567	Value Analysis and Value Engineering	PEC	3	0	0	3	40	60	100
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OPEN ELECTIVE COURSES OFFERED BY AGRICULTURAL ENGINEERING

Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23AG601	Principles of Food Preservation	OEC	3	0	0	3	40	60	100
23AG602	Organic Farming	OEC	3	0	0	3	40	60	100
23AG603	Renewable Energy Technology	OEC	3	0	0	3	40	60	100
23AG604	Urban Horticulture	OEC	3	0	0	3	40	60	100
23AG605	Rooftop Gardening Techniques	OEC	3	0	0	3	40	60	100
23AG606	Value Addition in Agricultural Products	OEC	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES OFFERED BY ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23AD601	Artificial Intelligence for Everyone	OEC	3	0	0	3	40	60	100
23AD602	Fundamentals of Machine Learning	OEC	3	0	0	3	40	60	100
23AD603	Data Science for Engineers	OEC	3	0	0	3	40	60	100
23AD604	Artificial Intelligence in Healthcare	OEC	3	0	0	3	40	60	100
23AD605	Business Intelligence and Analytics	OEC	3	0	0	3	40	60	100
23AD606	Java Programming	OEC	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES OFFERED BY COMPUTER SCIENCE AND ENGINEERING

Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23CS601	Fundamentals of Software Project Management	OEC	3	0	0	3	40	60	100
23CS602	Stack Technologies for Engineers	OEC	3	0	0	3	40	60	100
23CS603	Storage Area Networks	OEC	3	0	0	3	40	60	100

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23CS604	Digital Marketing	OEC	3	0	0	3	40	60	100
23CS605	Fundamentals of Multimedia Animation	OEC	3	0	0	3	40	60	100
23CS606	Network Forensics	OEC	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES OFFERED BY CYBERSECURITY

Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23CB601	Fundamentals of Information Security	OEC	3	0	0	3	40	60	100
23CB602	Cryptography and Network Security	OEC	3	0	0	3	40	60	100
23CB603	Ethical Hacking	OEC	3	0	0	3	40	60	100
23CB604	Digital Marketing	OEC	3	0	0	3	40	60	100
23CB605	R Programming	OEC	3	0	0	3	40	60	100
23CB606	Linux Programming	OEC	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES OFFERED BY ELECTRONICS AND COMMUNICATION ENGINEERING

Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23EC601	Fundamentals of Communication Systems	OEC	3	0	0	3	40	60	100
23EC602	Remote Sensing Concepts	OEC	3	0	0	3	40	60	100
23EC603	Wireless Networks	OEC	3	0	0	3	40	60	100
23EC604	Consumer Electronics	OEC	3	0	0	3	40	60	100
23EC605	Fundamentals of Image Processing	OEC	3	0	0	3	40	60	100
23EC606	Machine Vision System	OEC	3	0	0	3	40	60	100


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OPEN ELECTIVE COURSES OFFERED BY INFORMATION TECHNOLOGY

Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23IT601	Fundamentals of Database Management System	OEC	3	0	0	3	40	60	100
23IT602	Android and IOS Application Development	OEC	3	0	0	3	40	60	100
23IT603	Foundation of IoT Concepts and Applications	OEC	3	0	0	3	40	60	100
23IT604	Fundamentals of Web Technology	OEC	3	0	0	3	40	60	100
23IT605	Fundamentals of Cloud Computing	OEC	3	0	0	3	40	60	100
23IT606	Animation Techniques	OEC	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES (For Other Branches)

Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23ME601	Industrial Safety	OEC	3	0	0	3	40	60	100
23ME602	Electric Vehicle Technology	OEC	3	0	0	3	40	60	100
23ME603	Digital Manufacturing	OEC	3	0	0	3	40	60	100
23ME604	Fundamentals of Robotics	OEC	3	0	3	3	40	60	100
23ME605	Total Quality Management	OEC	3	0	3	3	40	60	100
23ME606	Engineering Economics	OEC	3	0	3	3	40	60	100


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MINOR DEGREE COURSES- PRODUCT DESIGN AND DEVELOPMENT (For Other Branches)									
Course Code	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CIA	ESE	Total
23ME901	New Product Development	MEC	3	0	0	3	40	60	100
23ME902	Product Life Cycle Management	MEC	3	0	0	3	40	60	100
23ME903	Ergonomics in Design	MEC	3	0	0	3	40	60	100
23ME904	CAD/CAM	MEC	3	0	3	3	40	60	100
23ME905	Reverse Engineering	MEC	3	0	3	3	40	60	100
23ME906	Rapid Prototyping Techniques	MEC	3	0	3	3	40	60	100

SUMMARY

S.No	Category	Credits per semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	5	1	-	3	-	-	3	-	12
2	BSC	12	4	4	4	-	-	-	-	24
3	ESC	5	13	3	-	-	-	-	-	21
4	PCC	-	-	15	16	13	12	8	-	64
5	PEC	-	-	-	-	6	3	6	-	15
6	OEC	-	-	-	-	3	6	3	-	12
7	EEC	-	2	1	1	1	3	1	10	19
8	MC	✓	-	-	✓	-	✓	✓	-	4 Courses
Total		22	20	23	24	23	24	21	10	167

HSMC - Humanities and Social Sciences

BSC - Basic Science Courses

ESC - Engineering Science Courses

PCC - Professional Core Courses

PEC - Professional Elective Courses

OE - Open Elective Courses

EEC - Employability Enhancement Courses

MC - Mandatory Courses (Non-Credit Courses)

CIA - Continuous Internal Assessment

ESE - End Semester Examination



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I SEMESTER

23EN101	COMMUNICATIVE ENGLISH (Common to all B.E./B.Tech Programmes)	L 3	T 0	P 0	C 3
Category	HUMANITIES, SOCIAL SCIENCE AND MANAGEMENT COURSE (HSMC)				
Pre requisites	Nil				

Course Objectives

The course is intended to

- Enable the students to assimilate the correct patterns of the language.
- Develop students' insight into the structure of the English language.
- Enrich vocabulary bank, to communicate more effectively in English,
- Express opinions including facts & ideas & maintain conversation in everyday situations.
- Use digital literacy tools their LSRW skills can be enhanced and to master good speaking Skills with different strategies.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Outline the basics of English communication	Understand
CO 2	Contrast the ways in which written and spoken communication differ.	Understand
CO 3	Relate the descriptive and analytical words, phrases, and sentence structures.	Understand
CO 4	Identify various text kinds and understand their connotative and denotative implications.	Apply
CO 5	Utilize several text kinds using the proper formats.	Apply

Course Contents

Unit – I	Basics of Communication	9
Listening – Telephone conversation & Writing message, gap filling; Reading – Telephone message, bio-note; Writing – Personal profile; Grammar – Simple present tense, Present continuous tense, Asking questions (wh-questions); Vocabulary – GRE Vocabulary.		
Unit – II	Narration	9
Listening – Travel/Fiction podcast, Watching a travel documentary; Reading – An excerpt from a travelogue, Newspaper Report; Writing – Narrative (Event, personal experience etc.); Grammar – Subject – verb agreement, Simple past, Past continuous Tenses; Vocabulary – Antonyms, Word formation (Prefix and Suffix).		
Unit – III	Description	9
Listening – Conversation, Radio/TV advertisement/BBC Documents; Reading – A tourist brochure and planning an itinerary, descriptive article / excerpt from literature; Writing – Definitions, Descriptive writing, Checklists; Grammar – Future tense, Perfect tenses, Preposition; Vocabulary – Adjectives and Adverbs.		


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Unit – IV	Classification	9
Listening – Announcements and filling a table; Reading – An article, social media posts and classifying (channel conversion – text to table), IELTS & TOEFL, BEC materials; Writing – Note making, Note taking and Summarising, a classification paragraph; Grammar – Connectives, Transition words; Vocabulary – Contextual vocabulary, Words used both as noun and verb, Classification related words.		
Unit – V	Expression of Views	9
Listening – Debate / Discussion; Reading – Formal letters, Letters to Editor, Opinion articles / Blogs; Writing – Letter writing/ Email writing (Enquiry / Permission, Letter to Editor), Resume Writing; Grammar – Question tags, Indirect questions, Yes / No questions; Vocabulary – Compound words, Phrasal verbs, Articles-Review of Movie/Documentary/Short-films.		
		Total : 45 Hours

Text Books

1. Anna University, Division of Humanities and Social Sciences. English for Engineers and Technologists. Vol. 1: A Skills Approach, Orient Longman, 2002.
2. Trimble, Louis, English for Science and Technology. Vol. 1: A Discourse Approach, Cambridge University Press. 2023.
3. Kumar, Sanjay & Lata, Pushp. Communication Skills. New Delhi: Oxford University Press, 2018.

Reference Books

1. C.Richards Jack. Interchange Fifth Edition, Cambridge University Press, 2017.
2. Wallwork Adrian, Springer. English for Academic Correspondence and Socializing. Cambridge University Press. 2011.
3. Cortrell, Stella. The Study Skills Handbook. Fourth Edition, Red Globe Press, 2013.
4. Kumar, Sanjay & Lata, Pushp. Communication Skills, Oxford University Press, 2011.

Additional / Web References

1. <https://nptel.ac.in/courses/109106094>
2. nptel.ac.in/courses/109/104/109104090/
3. <http://www.uefap.com/grammar/gramfram.htm>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	-	-	-	2	-	-	-	2	3	-	3			
CO 2	-	-	-	-	2	-	-	-	2	3	-	3			
CO 3	-	-	-	-	2	-	-	-	2	3	-	3			
CO 4	-	-	-	-	2	-	-	-	2	3	-	3			
CO 5	-	-	-	-	2	-	-	-	2	3	-	3			
Average	-	-	-	-	2	-	-	-	2	3	-	3			

3 – High

2 – Medium

1 – low

"- -" - No Correlation


CHAIRMAN-BOARD OF STUDIES

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
Total			40		60	

23MA201	ENGINEERING MATHEMATICS-I (Common to all B.E/ B.Tech Programmes)	L	T	P	C
		3	1	0	4
Category	Basic science (BS)				
Pre requisites	Nil				

Course Objectives

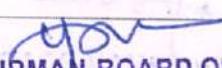
The course is intended to

- Develop the use of matrix algebra techniques that are needed by engineers for practical applications.
- Familiarize the student with differentiation rules.
- Familiarize the student with functions of several variables this is needed in many branches of engineering.
- Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
- Acquire the knowledge of ordinary differential equation in both variable and constant coefficients.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Make use of matrix theory for solving system of linear equations and compute eigenvalues and eigenvectors required for matrix diagonalization process.	Apply
CO 2	Interpret various concepts of differential calculus like limit, continuity, differentiability, Successive differentiation and study it's applicability in maxima and minima of one variable.	Understand
CO 3	Construct the application of partial differentiation and apply for evaluating maxima and minima of functions of multi variables.	Apply
CO 4	Make use of the concept of change of order of integration to evaluate multiple integrals and their usage in computing the area and volume.	Apply
CO 5	Illustrate ordinary differential equations to solve constant and variable coefficient problems.	Understand


CHAIRMAN-BOARD OF STUDIES

Course Contents		
Unit – I	Matrices	9+3
Characteristic equation -Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors - Diagonalization of matrices- Reduction of a quadratic form to canonical form by orthogonal transformation- Nature of quadratic form-Cayley -Hamilton theorem.		
Unit – II	Differential Calculus	9+3
Representation of functions -Limit of a function - Continuity- Derivatives -Differentiation rules - Taylor's series - Maclaurin series- Maxima and Minima of functions of one variable.		
Unit – III	Multivariable Calculus	9+3
Partial differentiation - Homogeneous functions and Euler's theorem - Jacobians -Taylor's series for functions of two variables - Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.		
Unit – IV	Multiple Integrals	9+3
Double integrals - Area enclosed by plane curves- Double integrals in polar coordinates - Change of order of integration -Triple integrals - Volume of solids (Cartesian Co-ordinates only).		
Unit – V	Ordinary Differential Equations	9+3
Higher order linear differential equations with constant coefficients -Homogeneous Equation of Euler's and Legendre's Types of linear equations with Variable Coefficients - Method of variation of parameters.		
Total : 60 Periods		

Text Books
1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S. "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, " Calculus: Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015.
Reference Books
1. Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016.
2. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media, New Delhi, 7 th Edition, 2009.
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5 th Edition, 2016.
Additional / Web References
1. https://nptel.ac.in/courses/122104018
2. https://nptel.ac.in/courses/111105122
3. https://nptel.ac.in/courses/111107108



CHAIRMAN-BOARD OF STUDIES

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)												
COs	POs											
CO 1	1	2	3	4	5	6	7	8	9	10	11	12
CO 2	3	2							1	1		
CO 3	3	2							1	1		
CO 4	3	2							1	1		
CO 5	3	2							1	1		
Average	3	2							1	1		

"3" – High

"2" – Medium

"1" – low

"-“ - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
					Total	40
						60

23PH201	PHYSICS FOR ENGINEERS (Common to BME, Mech, ECE and AGRI)	L	T	P	C
Category	Basic Sciences	3	0	0	3
Pre requisites	Nil				

Course Objectives

The course is intended to

- Make the students effectively achieve an understanding of mechanics.
- Enable the students to gain knowledge of electromagnetic waves and its applications.
- Introduce the basics of oscillations, optics and lasers.
- Equip the students to be successfully understand the importance of quantum physics.
- Motivate the students towards the applications of quantum mechanics.


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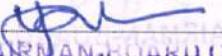
Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Interpret the concepts of mechanics in the rotational system.	Understand
CO 2	Explain the Maxwell's equations and time varying electric field to show the nature of propagation of electromagnetic waves, radiation pressure and its energy through free space, non-conducting and conducting media.	Understand
CO 3	Interpret the foundational knowledge of physics to recognize phenomena of oscillations, optics and lasers.	Understand
CO 4	Extend the concepts of Schrodinger wave equation to calculate the matter waves energy & momentum, probability of finding the particle and wave function of quantum system.	Understand
CO 5	Make use of advanced physics concepts of quantum theory and its application in tunneling microscopes.	Apply

Course Contents

Unit – I	Mechanics	9
Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.		
Unit – II	Electromagnetic Waves	9
The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence.		
Unit – III	Oscillations , Optics and Lasers	9
Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference - Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.		
Unit – IV	Basic Quantum Mechanics	9
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.		


CHAIRMAN-BOARD OF STUDIES

Unit – V	Applied Quantum Mechanics	9
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.		
Total : 45 Hours		

Text Books

1. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw-Hill, Seventh Edition, 2017.
2. E.M.Purcell and D.J.Morin, "Electricity and Magnetism", Cambridge Univ.Press, 2013.
3. Gaur R K, Gupta S L "Engineering Physics", Dhanpat Rai Publications., 2013.
4. Hugh D. Young, Roger A. Freedman, Lewis Ford .A "University Physics with Modern Physics", Pearson Education., India, 2008.

Reference Books

1. R.Wolfson "Essential University Physics". Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, "Physics – Volume 1 & 2", CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. "Lasers: Fundamentals and Applications", Laxmi Publications, (Indian Edition), 2019.
4. Halliday D, Resnick R, Walker J "Fundamentals of Physics", Wiley Publications, 2013.

Additional / Web References

1. <https://archive.nptel.ac.in/courses/115/106/115106119/>
2. <https://archive.nptel.ac.in/courses/115/101/115101005/>
3. <https://archive.nptel.ac.in/courses/115/102/115102124/>
4. <https://archive.nptel.ac.in/courses/115/101/115101107/>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

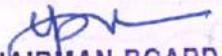
COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	2	-	-	2
CO 3	3	-	-	-	-	-	-	-	2	-	-	2
CO 4	3	-	-	-	-	-	-	-	2	-	-	2
CO 5	3	-	-	-	-	-	-	-	2	-	-	2
Average	3	-	-	-	-	-	-	-	2	-	-	2

3 – High

2 – Medium

1 – low

“-” - No Correlation


CHAIRMAN-BOARD OF STUDIES

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
Total			40		60	

23CY201	CHEMISTRY FOR ENGINEERS (Common to all B.E.,/B.Tech Programmes)	L	T	P	C
		3	0	0	3
Category	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

- Impart knowledge on the various sources of water and its impurities.
- Impart knowledge on the basic principles and preparatory methods of nanomaterials.
- Facilitate the understanding of different types of fuels, their preparation, properties and Combustion characteristics.
- Familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.
- Familiarize different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Recognize water quality parameters and water treatment techniques for the polluted water.	Understand
CO 2	Outline the various synthesis processes of nanomaterial and enumerate its applications in various fields.	Understand
CO 3	Illustrate the composition, calorific values, uses of natural fuels and the manufacture of synthetic and bio fuels.	Understand
CO 4	Infer the knowledge of operating ideology, working process and application of energy conversion and storage devices.	Understand
CO 5	Reveal the basic concepts, processing of polymer and its chemistry in engineering and technology.	Understand

 **CHAIRMAN-BOARD OF STUDIES**

Course Contents		
Unit – I	Water treatment	9
Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.		
Unit – II	Nanochemistry	9
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.		
Unit – III	Fuels and combustion	9
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil – cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO ₂ emission and carbon foot print.		
Unit – IV	Energy sources and storage devices	9
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion battery; Electric vehicles – working principles; Fuel cells: H ₂ -O ₂ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.		
Unit – V	Polymer chemistry	9
Introduction: Functionality-degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces). Mechanism of free radical addition polymerization. Properties of polymers: T _g , tacticity, molecular weight-number average, weight average, viscosity average and polydispersity index (Problems). Techniques of polymerization: Bulk, emulsion, solution and suspension. Engineering Plastics: Polyamides, Polycarbonates and Polyurethanes. Compounding and Fabrication Techniques: Injection, Extrusion, Blow and Calendering.		
Text Books		Total : 45 Hours
1. P. C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.		

 **CHAIRMAN-BOARD OF STUDIES**

B.E. Mechanical Engineering (R-2023)

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| 2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012. |
| 3. S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018. |

Reference Books

- | |
|--|
| 1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014. |
| 2. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019. |
| 3. O.V. Roussak and H.D. Gesser, Applied Chemistry: A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013. |

Additional / Web References

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|--|
| 1. https://nptel.ac.in/courses/122101001 |
|--|

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	2	-	-	-	-	2	-	1	-	-	1
CO 2	3	-	-	-	-	-	-	-	-	-	-	1
CO 3	3	-	-	-	-	-	2	-	1	-	-	1
CO 4	3	-	-	-	-	-	2	-	-	-	-	1
CO 5	3	-	-	-	-	-	-	-	1	-	-	1
Average	3	-	-	-	-	-	2	-	1	-	-	1

3 – High

2 – Medium

1 – low

"-" - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
Total			40		60	


CHAIRMAN-BOARD OF STUDIES

23CS301	PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to all B.E/ B.Tech Programmes)	L	T	P	C
Category	Engineering Science	3	0	0	3
Pre requisites	Nil				

Course Objectives

The course is intended to

- Understand the basics of algorithmic problem solving.
- Develop and solve problems using python conditionals and loops.
- Develop and use function calls to solve problems.
- Construct python data structures - lists, tuples, dictionaries to represent complex data.
- Implement input/output with file exceptions in python.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Develop logical solutions to simple and complex computational problems.	Apply
CO 2	Develop and execute python programs using conditionals and loops	Apply
CO 3	Implement python programs using functions for searching operations	Apply
CO 4	Execute the lists, tuples and dictionary created in python	Apply
CO 5	Implement a module to read & write data with exceptions.	Apply

Course Contents

Unit – I	Basic Programming Representations	9
Fundamentals of Computer, Identification of Computational Problems, Algorithms, building blocks of algorithms (statements, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.		
Unit – II	Different Data Types	9
Introduction to python, Python interactive and script mode, data types: numeric, boolean, string, list, tuple, dictionary and set; identifier, variables, keywords, expressions, statements, assignment, precedence of operators, comments, indentation; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.		
Unit – III	Functional Flow	9
Conditionals: Boolean values and Operators, if statement, alternative statement, nested statements, chained conditional; Iteration: state, while, for, break, continue, pass; Input and Output; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string methods, string module; Lists as arrays, creation of arrays and operations on arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.		

CHAIRMAN-BOARD OF STUDIES

Passed in Board of Studies Meeting on 27.10.2023

Approved in Academic Council Meeting on 07.11.2023

Unit – IV	Types of Data Structures	9
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, advanced list processing - list comprehension (Map, Filter, Lambda and Reduce); Tuples: tuple introduction, tuple assignment, tuple as return value; Dictionaries: operations and methods; Sets: set introduction, set operations; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.		
Unit – V	Files, Modules, Packages	9
Files: text files, reading and writing files, file positions, format operator, directory methods, command line arguments, Exceptions: errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).		
Total : 45 Periods		

Text Books

- Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
- Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

Reference Books

- Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
- G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
- John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.

Additional / Web References

- <https://learnengineering.in/ge3151-problem-solving-and-python-programming/>
- <https://www.scribd.com/document/546667558/GE3151-PROBLEM-SOLVING-AND-PYTHON-PROGRAMMING>
- <https://padeepz.net/ge3151-notes-problem-solving-and-python-programming-regulation-2021-anna-university/>
- https://onlinecourses.nptel.ac.in/noc21_cs32/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	3	3	3	2	-	-	-	-	-	2	2
CO 2	3	3	3	3	2	-	-	-	-	-	2	2
CO 3	3	3	3	3	2	-	-	-	-	-	2	2
CO 4	2	2	-	2	2	-	-	-	-	-	2	2
CO 5	3	2	-	-	2	-	-	-	-	-	2	2
Average	2	3	3	3	2	-	-	-	-	-	2	2

3 – High

2 – Medium

1 – Low

‘-’ - No Correlation

CHAIRMAN-BOARD OF STUDIES

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
			Total		40	60

CHIEF BOARD OF STUDIES

தமிழ் மரபு

23TA101

L T P C

1001

அலகு 1 மொழி மற்றும் இலக்கியம்:

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிரதல் அறும் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பெளத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கிகயத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரததாசன் ஆகியோரின் பங்களிப்பு.

அலகு 2 மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை:

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஜம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கள், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு 3 நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4 தமிழர்களின் தினைக் கோட்பாடுகள்:

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறுக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இங்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5 இந்திய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:

இந்திய விவடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கலவெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநால் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்வியல் துறை வெளியீடு).
4. பொருநை - ஆழ்ந்தங்கரை நாகரிகம். (தொல்வியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu), (Published by: International Institute of Tamil Studies)
8. The Contributions of Tamils of Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by RMRL) – Reference Book.


CHAIRMAN-BOARD OF STUDIES

HERITAGE OF TAMILS

23TA101

**L T P C
1 0 0 1**

UNIT I LANGUAGE AND LITERATURE

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyan and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS

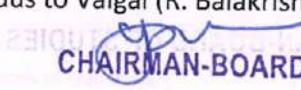
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநால் மற்றும் கல்லியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu), (Published by: International Institute of Tamil Studies)
8. The Contributions of Tamils of Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by RMRL) – Reference Book.


CHAIRMAN-BOARD OF STUDIES

23PC201	PHYSICS AND CHEMISTRY LABORATORY (Common to all B.E./B.Tech Programmes)	L	T	P	C
		0	0	4	2
Category	Basic sciences				
Pre requisites	Physics and chemistry				

Course Objectives

The course is intended to

- Measure various physical parameter of solid and matter waves.
- Identify the velocity of ultrasonic waves in different liquid medium.
- Measure acceptance angle, groove width and wave length of laser.
- Demonstrate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO and chloride.
- Familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Develop the experimental skills on physical properties of materials and matter waves.	Apply
CO 2	Make use of concepts of sound to measure physical properties of given liquids.	Apply
CO 3	Identify various physical parameters of object with concepts of optics.	Apply
CO 4	Analyze the quality of water samples with respect to their acidity, alkalinity, hardness and DO.	Apply
CO 5	Determine the amount of metal ion through volumetric techniques.	Apply

List of Experiments in physics (Any Seven Experiments)

S.No	List of Exercises	CO	Blooms Taxonomy
1.	Simple harmonic oscillations of cantilever.	CO 1	Apply
2.	Non-uniform bending - Determination of Young's modulus.	CO 1	Apply
3.	Melde's string experiment.	CO 1	Apply
4.	Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.	CO 2	Apply
5.	Photoelectric effect.	CO 3	Apply
6.	Air wedge - Determination of thickness of a thin sheet/wire.	CO 3	Apply
7.	a) Optical fibre -Determination of Numerical Aperture and acceptance angle b) Compact disc- Determination of width of the groove using laser.	CO 3	Apply
8.	Laser- Determination of the wave length of the laser using grating.	CO 3	Apply

[Signature]
Total : 30 Periods

CHAIRMAN-BOARD OF STUDIES

List of Experiments in Chemistry (Any Seven Experiments)

S.No	List of Exercises	CO	Blooms Taxonomy
1.	Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.	CO 4	Apply
2.	Determination of types and amount of alkalinity in a water sample - Split the first experiment into two.	CO 4	Apply
3.	Determination of total, temporary & permanent hardness of water by EDTA method.	CO 4	Apply
4.	Determination of DO content of water sample by Winkler's method.	CO 4	Apply
5.	Determination of chloride content of water sample by Argentometric method.	CO 4	Apply
6.	Determination of strength of given hydrochloric acid using pH meter.	CO 5	Apply
7.	Determination of strength of acids in a mixture of acids using conductivity meter.	CO 5	Apply
8.	Estimation of iron content of the given solution using potentiometer.	CO 5	Apply

Total : 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

CO	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	2	2	-	-	-	-	-	-	2	-	-	-
CO 2	2	2	-	-	-	-	-	-	2	-	-	-
CO 3	2	2	-	-	-	-	-	-	2	-	-	-
CO 4	2	2	-	-	-	-	-	-	2	-	-	-
CO 5	2	2	-	-	-	-	-	-	2	-	-	-
Average	2	2	-	-	-	-	-	-	2	-	-	-

S. No.	Assessment Method	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
1	Observation, Analysis of Experimental results & Record, Viva-voce based on rubrics.	100	75	45	40
2	Model Examination	100	25	15	
Total				60	40



CHAIRMAN-BOARD OF STUDIES

23CS302	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to all B.E/ B.Tech Programmes)	L 0	T 0	P 3	C 1.5
Category	Engineering Science				
Pre requisites	Nil				

Course Objectives

The course is intended to

- Develop the problem-solving skills to complex problems
- Develop the basic programming constructs in Python.
- Implement various gaming strategies in python to solve real world problems.
- Model a data structure using lists, tuples, dictionaries in python.
- Make use of input / output operations with files in Python.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO No.	Course Outcome	Bloom's Level
CO 1	Develop algorithmic solutions to simple computational problems	Apply
CO 2	Implement programs in Python using conditionals and loops for solving problems.	Apply
CO 3	Implement programs in Python for real time applications using functions	Apply
CO 4	Implement programs in Python for real time applications using exception handling.	Apply
CO 5	Develop gaming applications using Python	Apply

S.No	List of Exercises	CO	Bloom's Taxonomy
1.	Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)	CO 1	Apply
2.	Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).	CO 2	Apply
3.	Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)	CO 2	Apply
4.	Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of	CO 3	Apply

CHAIRMAN-BOARD OF STUDIES

Passed in Board of Studies Meeting on 27.10.2023

Approved in Academic Council Meeting on 07.11.2023

	a car/ Materials required for construction of a building – operations of list & tuples)		
5.	Implementing programs using Functions. (Factorial, largest number in a list, area of shape)	CO 3	Apply
6.	Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)	CO 4	Apply
7.	Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)	CO 4	Apply
8.	Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)	CO 4	Apply
9.	Exploring Pygame tool.	CO 4	Apply
10.	Developing a game activity using Pygame like bouncing ball, car race etc.	CO 5	Apply
Total : 45 Periods			

Reference Books

1. Manual-prepared by SSCET

Additional / Web References

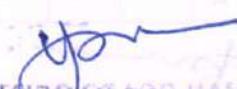
1. <http://nptel.ac.in/courses/112104113/>
2. <http://nptel.ac.in/courses/112108148/>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

CO	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	3	3	3	2	-	-	-	-	-	2	2
CO 2	3	3	3	3	2	-	-	-	-	-	2	2
CO 3	3	3	3	3	2	-	-	-	-	-	2	-
CO 4	2	2	-	2	2	-	-	-	-	-	2	-
CO 5	2	2	-	-	2	-	-	-	-	-	2	-
CO 6	2	2	-	-	2	-	-	-	-	-	2	-
Average	2	3	3	3	2	-	-	-	-	-	2	2


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S. No.	Assessment Method	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
1	Observation, Analysis of Experimental results & Record, Viva-voce based on rubrics.	100	75	45	40
2	Model Examination	100	25	15	
Total			60	40	


CHAIRMAN-BOARD OF STUDIES

23EN102	Communication Laboratory (Common to All B.E/B.Tech Programs)	L	T	P	C
		0	0	2	1
Category	HUMANITIES, SOCIAL SCIENCE AND MANAGEMENT COURSE (HSMC)				
Pre requisites	Nil				

Course Objectives

The course is intended to

- Improve the communicative competence of learners
- Help learners use language effectively in academic /work contexts
- Develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- Build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- Use language efficiently in expressing their opinions via various media.

Course Contents

Unit – I	Introduction to Fundamental of Communication	6
Listening - Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form; BBC Radio/Research find YouTube channel.		
Speaking - making telephone calls-Self Introduction; Introducing a friend; - 42 politeness strategies-making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example), PPT Presentation.		
Unit – II	Narration	6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities, Oral writing (Extract videos), and Document national statement. Listening to TED Talks. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings engaging in small talk-describing requirements and abilities, making predictions- talking about a given topic-giving opinions, understanding a website-describing processes.		
Unit – III	Reading	6
Reading – Reading Novel/ Auto-biography/ Award winning novels/ Self-motivation books/ Basic economics books.		
Unit – IV	Reading	
Reading- longer texts- close reading, Reading exercise: IELTS & TOEFL, BEC, Journals, Newspapers, Reading edition, Comprehension-reading longer texts- reading different types of texts- magazines.		



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Unit – V	Writing	6
Writing- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing. Fill in the blanks: Proposal, Resume writing, PPT, AI tools, Letter writing, informal or personal letters-e-mails-conventions of personal email. Using Chat GPT & Language tools, screening of English movies.		
Total : 30 Hours		

Text Books

1. Anna University, Division of Humanities and Social Sciences, *English for Engineers and Technologists*. Vol. 1: *A Skills Approach*, Orient Longman, 2002.
2. Trimble Louis, *English for Science and Technology*, Vol. 1: *A Discourse Approach*. England: Cambridge University Press, 2023.
3. Kumar, Sanjay & Lata, Pushp. *Communication Skills*, Oxford University Press, 2011.

Reference Books

1. C.Richards Jack. *Interchange Fifth Edition*, Cambridge University Press, 2017.
2. Wallwork Adrian, Springer. *English for Academic Correspondence and Socializing*, Cambridge University Press. 2011.

Additional / Web References

1. <https://nptel.ac.in/courses/109106094>
2. nptel.ac.in/courses/109/104/109104090/
3. <http://www.uefap.com/grammar/gramfram.html>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

Cos	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	-	-	-	2	-	-	-	2	3	-	3			
CO 2	-	-	-	-	2	-	-	-	2	3	-	3			
CO 3	-	-	-	-	2	-	-	-	2	3	-	3			
CO 4	-	-	-	-	2	-	-	-	2	3	-	3			
CO 5	-	-	-	-	2	-	-	-	2	3	-	3			
Average	-	-	-	-	2	-	-	-	2	3	-	3			

"3" – High

"2" – Medium

"1" – low

"- " - No Correlation



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S. No.	Assessment Method	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
1	Observation, Analysis of Experimental results & Record, Viva-voce based on rubrics.	100	75	45	40
2	Model Examination	100	25	15	
Total				60	40

23MC801 INDUCTION PROGRAMME

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over. The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character."

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

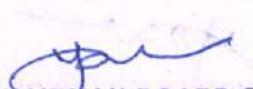
The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.



CHAIRMAN-BOARD OF STUDIES

(iii) **Universal Human Values**

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) **Literary Activity**

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) **Proficiency Modules**

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) **Lectures by Eminent People**

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) **Visits to Local Area**

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) **Familiarization to Dept./Branch & Innovations**

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) **Department Specific Activities**

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering

/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.




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II SEMESTER

23MA202	ENGINEERING MATHEMATICS-II (Common to all B.E/ B.Tech Programmes)	L 3	T 1	P 0	C 4
Category	Basic Sciences (BS)				
Pre requisites	23MA201				

Course Objectives

The course is intended to

- Demonstrate the basic concepts of PDE for solving standard partial differential equations.
- Interpreting techniques of vector calculus to solve problems in integration over a curve.
- Familiarize the concepts of complex integration to solve contour problems.
- Introduce Fourier series analysis which is central to many applications in Engineering apart from its use in solving boundary value problems.
- Acquaint the student with Fourier transform techniques used in wide variety of situations.

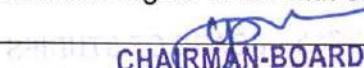
Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Demonstrate the formation of PDE to solve homogeneous and non-homogeneous problems.	Understand
CO 2	Acquire knowledge vector calculus to evaluate integration over a curve.	Apply
CO 3	Construct Cauchy integral theorem and residue theorem to evaluate contour integration.	Apply
CO 4	Utilize the fourier series of periodic functions and solve differential equations using fourier analysis.	Apply
CO 5	Contrast mathematical principles on transforms of periodic and non-periodic functions.	Understand

Course Contents

Unit – I	Partial Differential Equations	9+3
Formation of partial differential equations - Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Homogenous Linear partial differential equations of second and higher order with constant coefficients.		

 **CHAIRMAN-BOARD OF STUDIES**

Unit – II	Vector calculus	9+3
Gradient and directional derivative - Divergence and curl - Irrotational and solenoidal vector fields - Line integral over a plane curve - Surface integral and volume integral - Green's, Gauss divergence and Stokes' theorems (proofs excluded).		
Unit – III	Complex Integration	9+3
Line integral - Cauchy's theorem and integral formula - Taylor's and Laurent's series - Singularities - Residues - Residue theorem-Application of residue theorem for evaluation of real integrals - Use of circular contour and semi-circular contour with no pole on real axis.		
Unit – IV	Fourier series	9+3
Dirichlet's conditions - General Fourier series - Odd and even functions - Half range Sine and Cosine series - Parseval's identity - Harmonic Analysis - Complex form of Fourier series.		
Unit – V	Fourier Transform	9+3
Fourier integral theorem - Fourier transform pair - Sine and Cosine transforms - Properties - Transform of elementary functions - Convolution theorem - Parseval's identity.		
Total : 60 Periods		

Text Books

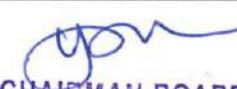
1. Friedberg. A.H., Insel. A.J. and Spence. L., "Linear Algebra", Prentice Hall of India, New Delhi, 4th Edition, 2004.
2. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, New Delhi, 2011.
3. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.

Reference Books

1. Kolman. B. Hill. D.R., "Introductory Linear Algebra", Pearson Education, New Delhi, First Reprint, 2009.
2. Dass, H.K., and Er. Rajnish Verma," Higher Engineering Mathematics", S. Chand Private Ltd., 2011.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

Additional / Web References

- 1.<https://nptel.ac.in/courses/111106094>
- 2.<https://archive.nptel.ac.in/courses/111/103/111103070/>
- 3.<https://nptel.ac.in/courses/111106111>


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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	1	2	3	4	5	6	7	8	9	10	11	12
CO 2	3	2							1	1		
CO 3	3	2							1	1		
CO 4	3	2							1	1		
CO 5	3	2							1	1		
Average	3	2							1	1		

"3"- High

"2" - Medium

"1" - low

"-“ - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
Total					40	60



CHAIRMAN-BOARD OF STUDIES

23ME301	ENGINEERING GRAPHICS	L	T	P	C
		3	1	0	4
Category	Engineering Sciences				
Pre requisites	NIL				

Course Objectives

The course is intended to

- Develop graphical skills for the construction of curves
- Expose the orthographic principles through lines and planes.
- Demonstrate the concepts of orthographic projections of solids
- Impart the knowledge on sectioning solids and development of lateral surfaces of solids
- Exposure to the significance of isometric projections

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Sketch the engineering curves as per engineering drawing standards	Understand
CO 2	Illustrate the orthographic projections to construct lines and planar surface	Understand
CO 3	Construct the orthographic views of solids	Apply
CO 4	Develop the lateral surfaces of solids using drawing standards	Apply
CO 5	Sketch the isometric projection and perspective projection of simple solids	Apply

Course Contents

Unit – I	Plane Curves	12
Importance of graphics in engineering applications - Use of drafting instruments - Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.		
Unit – II	Projection of Lines and Plane Surface	12
	Orthographic projection-Principal planes-First angle projection-Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.	
Unit – III	Projection of Solids	12



CHIEF EXAMINER
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Projection of solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.

Unit – IV	Projection of Sectioned Solids and Development of Surfaces	12
Sectioning of prisms, pyramids, cylinder, and cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones.		
Unit – V	Isometric Projection	12
Principles of isometric projection — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)		
Total : 60 Hours		

Text Books

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natarajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Reference Books

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2 nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27thEdition, 2017.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015
4. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.

Additional / Web References

1. <https://nptel.ac.in/courses/112103019>
2. https://en.wikipedia.org/wiki/Engineering_drawing



CHAIRMAN-BOARD OF STUDIES

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2	-	-	-	-	-	-	3	-	2	3	3	-
CO 2	3	2	2	-	-	-	-	-	-	3	-	2	3	3	-
CO 3	3	2	2	-	-	-	-	-	-	3	-	2	3	3	-
CO 4	3	2	2	-	-	-	-	-	-	3	-	2	3	3	-
CO 5	3	2	2	-	-	-	-	-	-	3	-	2	3	3	-
Average	3	2	2	-	-	-	-	-	-	3	-	2	3	3	-

3 - High

2 - Medium

1 - low

"- - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
Total					40	60



CHAIRMAN-BOARD OF STUDIES

23EC301	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to all B.E/ B.Tech. Programmes)	L	T	P	C
		3	0	0	3
Category	Engineering Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

- Solve electric circuits using basic laws.
- Impart knowledge of types, construction and working principles of transformer and concepts of protective devices.
- Familiarize the types, construction and working principles of electrical machines.
- Introduce the characteristics and applications of analog devices and logic gates.
- Acquaint the functional elements and working of measuring instruments.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Compute the electric circuit parameters using basic laws.	Apply
CO 2	Explain the construction and working of transformers and the concepts of protective devices.	Understand
CO 3	Explain the construction and working principles of Electrical Machines.	Understand
CO 4	Interpret the characteristics of analog electronic devices and logic gates	Apply
CO 5	Select appropriate measuring instruments for the given application.	Apply

Course Contents

Unit – I	ELECTRICAL CIRCUITS	9
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws -Independent and Dependent Sources - Simple problems- Nodal Analysis, Mesh analysis with independent sources only		
	Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor, Steady state analysis of RLC circuits	
Unit – II	TRANSFORMERS AND ELECTRICAL INSTALLATIONS	9

copy
CHARMAN-BOARD OF STUDIES

Transformer: Single Phase Transformer: Construction, principle of operation, EMF Equation, types of transformer, Regulation, Efficiency and applications of Transformer, Three phase transformer.

Types of wires and cables, earthing, protective devices - switch fuse unit - Miniature circuit breaker - moulded case circuit breaker - earth leakage circuit breaker, safety precautions and First Aid.

Unit – III	ELECTRICAL MACHINES	9
Construction of electrical machine, Working principle of Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction and working principle of alternator, Single phase Induction Motor, three phase induction motor.		
Unit – IV	ANALOG AND DIGITAL ELECTRONICS	9
Analog electronics: Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon, Germanium - PN Junction Diodes, Zener Diode -Characteristics Applications, Transistors: IV characteristics of BJT, FET, IGBT, UJT, Applications Digital electronics: Number Systems - Code Converters: BCD, Gray Code, Excess 3 – 1's complement, 2's complement - Logic Gates.		
Unit – V	MEASUREMENTS AND INSTRUMENTATION	9
Functional elements of an instrument, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Standards and calibration, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.		
Total : 45 Hours		

Text Books

1. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2011.
2. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill Education, Second Edition, 2020
3. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, 2014.
4. James A Svoboda, Richard C. Dorf, Introduction to Electric Circuits, Wiley, 2018

Reference Books

1. Muthusubramanian, R. Basic Electrical & Electronics Engineering, Tata McGraw Hill Education Private Limited, 2009.
2. Thomas L. Floyd, 'Electronic Devices', Pearson Education, Tenth Edition, 2017.
3. Thomas L. Floyd, 'Digital Fundamentals', Pearson Education, Eleventh Edition, 2018.
4. H.S. Kalsi, 'Electronic Instrumentation', McGraw-Hill education, New Delhi, 2018

Additional / Web References

1. <https://archive.nptel.ac.in/courses/117/106/117106108/>
2. <https://nptel.ac.in/courses/108/105/108105132/>
3. <https://nptel.ac.in/courses/108105153>



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COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2	-	-	-	-	-	-	-	2	2			
CO 2	3	2	2	-	-	-	-	-	-	-	1	2			
CO 3	3	2	2	-	-	-	-	-	-	-	2	2			
CO 4	3	2	2	-	-	-	-	-	-	-	2	2			
CO 5	3	1	1	-	-	-	-	-	-	-	2	2			
Average	3	1.8	1.8	-	-	-	-	-	-	-	1.8	2			

3 - High

2 - Medium

1 - Low

"-“ - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
Total					40	60



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தமிழரும் தொழில்நுட்பமும்

23TA102

L T P C

1001

அலகு 1 நெசவு மற்றும் பானைத் தொழில்நுட்பம்:

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும் சங்க காலத்தில் விட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகூல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக்கலை.

அலகு 3 உற்பத்தித் தொழில்நுட்பம்:

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எ.கு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்:

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுமித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நால்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநால் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆழ்ந்தங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu), (Published by: International Institute of Tamil Studies)
8. The Contributions of Tamils of Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by RMRL) – Reference Book.

 CHAIRMAN-BOARD OF STUDIES

TAMILS AND TECHNOLOGY

23TA102

LTPC1001

UNIT I WEAVING AND CERAMIC TECHNOLOGY

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநால் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu), (Published by: International Institute of Tamil Studies)
8. The Contributions of Tamils of Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamilnadu).
12. Journey of Civilization Indus to Vaiga [R. Balakrishnan] (Published by RMRL) – Reference Book.

CHAIRMAN-BOARD OF STUDIES

23IT301	PROGRAMMING IN C (Common for all programmes)	L	T	P	C
		3	0	2	4
Category	Engineering Science				
Pre requisites	Nil				

Course Objectives

The course is intended to

- Illustrate the constructs of C Language.
- Summarize C programs using arrays and strings.
- Implement modular applications in C using functions.
- Execute applications in C using pointers and structures.
- Examine the input/output and file handling in C.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
	Theory	
CO 1	Summarize the fundamentals of C Programming constructs.	Understand
CO 2	Illustrate the applications using arrays and strings.	Understand
CO 3	Integrate the modular applications in C using functions.	Apply
CO 4	Execute the applications in C using structures and pointers.	Apply
CO 5	Prepare the applications using sequential and random access file processing.	Apply
	Laboratory	
CO 6	Execute the knowledge on C programming constructs.	Apply


CHAIRMAN-BOARD OF STUDIES

CO 7	Experiment the programs in C using arrays and strings.	Apply
CO 8	Choose the applications in C using functions.	Apply
CO 9	Examine the applications in C using structures and pointers.	Apply
CO 10	Prepare the applications in C using file processing.	Apply

Course Contents

Unit – I	Basics of C Programming	9
Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants - Enumeration Constants - Keywords - Operators: Precedence and Associativity - Expressions - Input/Output statements - Decision making statements - Switch statement - Looping statements		
Unit – II	Arrays and Strings	9
Introduction to Arrays: Declaration, Initialization – One dimensional array -Two dimensional arrays - String operations: length, compare, concatenate, copy - Selection sort, linear and binary search.		
Unit – III	Functions and Pointers	9
Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) - Recursion, Binary Search using recursive functions -Pointers - Pointer operators - Pointer arithmetic - Arrays and pointers - Array of pointers - Parameter passing: Pass by value, Pass by reference.		
Unit – IV	Structures and Union	9
Structure - Nested structures – Pointer and Structures - Array of structures - Self-referential structures - Dynamic memory allocation - Singly linked list - typedef - Union - Storage classes and Visibility.		
Unit – V	File Processing	9
Files - Types of file processing: Sequential access, Random access - Sequential access file - Random access file - Command line arguments.		
Total : 45 Periods		


 CHAIRMAN-BOARD OF STUDIES

List of Exercises

S.No.	Name of the Exercise	CO	Bloom's Level
1	I/O statements, operators, expressions	CO 6	Apply
2	decision-making constructs: if-else, go to, switch-case, break-continue	CO 6	Apply
3	Loops: for, while, do-while	CO 6	Apply
4	Arrays: 1D and 2D,multi-dimensional arrays, traversal	CO 7	Apply
5	Strings: operations	CO 7	Apply
6	Functions: call, return, passing parameters by (value, reference), passing arrays to function.	CO 8	Apply
7	Recursion	CO 8	Apply
8	Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers	CO 9	Apply
9	Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.	CO 9	Apply
10	Files: reading and writing, File pointers, file operations, random access, processor directives.	CO 10	Apply

Text Books

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Pearson Education, Second Edition, 2015.

Reference Books

1. Paul Deitel and Harvey Deitel, "C How to Program: with an Introduction to C++", Pearson Education, Eighth edition, 2018.
2. Yashwant Kanetkar, Let us C, BPB Publications, 17th Edition, 2020.


CHAIRMAN-BOARD OF STUDIES

3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, Second Edition, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Pearson Education, 1st Edition, 2013.

Additional / Web References

1. <https://nptel.ac.in/courses/106104128>
2. <https://www.coursera.org/specializations/c-programming>
3. <https://www.udemy.com/course/c-programming-for-beginners-/>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2	-	3	-	-	-	2	-	-	2	-	-	-
CO 2	3	2	2	-	3	-	-	-	2	-	-	3	-	-	-
CO 3	3	3	2	-	3	-	-	-	2	-	-	2	-	-	-
CO 4	3	2	2	-	3	-	-	-	2	-	-	3	-	-	-
CO 5	3	2	3	-	3	-	-	-	2	-	-	2	-	-	-
CO 6	3	2	2	3	-	-	-	-	-	-	-	3	-	-	-
CO 7	3	2	2	3	-	-	-	-	-	-	-	3	-	-	-
CO 8	3	2	2	3	-	-	-	-	-	-	-	3	-	-	-
CO 9	3	2	2	3	-	-	-	-	-	-	-	3	-	-	-


CHAIRMAN-BOARD OF STUDIES

				-		-									
CO 10	3	2	2	3	-	-	-	-	-	-	-	3	-	-	-
Average	3	2. 1	2. 1	3	3	2	-	-	2	-	-	2.7	-	-	-

3 - High

2 - Medium

1- Low

‘-’ - No Correlation

Assessment	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
Theory Component						
CIA I	3 hours	2.5 units	100	10	20	50
CIA II	3 hours	2.5 units	100	10		
Practical Component						
Observation & Analysis of Experimental results, Viva Voce, Quiz based on rubrics.		All Experiments	75	22.5	30	-
Model Exam	3 hours		25	7.5		
Total					50	50

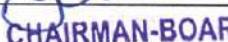

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23ME302	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2
Category	Engineering Sciences				
Pre requisites	Nil				

Course Objectives	
The course is intended to	
<ul style="list-style-type: none"> • Understand the basic carpentry, plumbing, sheet metal and welding operations. • Understand various wiring circuits and soldering & checking of continuity. 	

Course Outcomes		
CO. No.	Course Outcome	Bloom's Level
CO 1	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work	Understand
CO 2	Make joints in wood materials used in common household wood work	Apply
CO 3	Weld various joints in steel plates using arc welding work and use sheet metal practices in fabrication	Apply
CO 4	Wire various electrical joints in common household electrical wiring	Apply
CO 5	Solder and test simple electronic circuits; Assemble and dismantle computer	Apply

S.No	List of Exercises	CO	Blooms Taxonomy
GROUP-A (CIVIL & MECHANICAL)			
1.	Assemble the pipeline connections using tools for the given layout	CO 1	Apply
2.	Making wooden T- Joint, and lap joint using carpentry tools	CO 1	Apply
3.	Basic machining work- simple turning and facing	CO 2	Apply
4.	Welding a butt and lap joint using welding process	CO 3	Apply
5.	Make a tray in sheet metal for the given dimensions	CO 3	Apply
GROUP-B (ELECTRICAL & ELECTRONICS)			
6.	Stair case wiring	CO 4	Apply
7.	Fluorescent lamp wiring	CO4	Apply
8.	Energy meter wiring	CO4	Apply


CHAIRMAN-BOARD OF STUDIES

9.	Soldering simple electronic circuits and check the continuity	CO 5	Apply
10.	Assembly and dismantle of computer/ laptop/Mobile phones	CO 5	Apply

Total : 60 Periods

Reference Books

1. Manual-prepared by SSCET

Web References

1. <https://be-iitkgp.vlabs.ac.in/exp/familiarisation-resistor/>
2. <https://fab-coep.vlabs.ac.in/exp/computer-controlled-cutting/>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

CO	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2	2	1	-	-	-	3	2	-	-	3	2	-
CO 2	3	2	2	2	1	-	-	-	3	2	-	-	3	2	-
CO 3	3	2	2	2	1	-	-	-	3	2	-	-	3	2	-
CO 4	3	2	2	2	1	-	-	-	3	2	-	-	3	2	-
CO 5	3	2	2	2	1	-	-	-	3	2	-	-	3	2	-
Average	3	2	2	2	1	-	-	-	3	2	-	-	3	2	-

3– High

2 – Medium

1 – low

'-' - No Correlation

S. No.	Assessment Method	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
1	Observation, Analysis of Experimental results & Record, Viva-voce based on rubrics.	100	75	45	40
2	Model Examination	100	25	15	
Total				60	40



CHAIRMAN-BOARD OF STUDIES

23ME701	DESIGN THINKING	L	T	P	C
		2	0	0	2
Category	Employment Enhancement Course				
Pre requisites	Nil				

Course Objectives

The objectives of this course are to

1. Acquire knowledge in Design thinking concepts and process.
2. To inculcate attitude to solve societal problems using design thinking tools
3. Develop skills in solving problems using ideation tools.
4. Conceive, conceptualize, design and demonstrate innovative ideas using prototypes
5. Apply concepts for testing of prototypes

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Apply Design thinking concepts and principles to perform human centered design process for creative problem solving.	Apply
CO 2	Derive empathy maps to visualize user attitudes and behavior for gaining insights of customers.	Apply
CO 3	Develop innovative products or services for a customer base using ideation techniques.	Apply
CO 4	Use design thinking tools to build prototypes for complex problems using gathered user requirements.	Apply
CO 5	Improve prototype by testing it with a specific set of users for making it sustainable by following ethics.	Apply

Course Contents

Unit – I	Design Thinking Process	6
Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools.		
Unit – II	Empathize	6
Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools : Customer Journey Map, Personas.		
Unit – III	Ideation	6

 **CHAIRMAN-BOARD OF STUDIES**

Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method, Ideation Tools: How Might We? (HMW), Story board, Brainstorming.

Unit – IV	Prototype	6
Prototype - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype.		
Unit – V	Testing of Prototypes	6
Prototyping for physical products: uniqueness for physical products, Prototyping for digital products: What's unique for digital products, Preparation; Preparation; Testing prototypes with users.		

Total : 30 Hours

Text Books

1. Robert A Curedale, Design Thinking Process & Methods 4th Edition, December 2017,
2. Michael G. Luchs, Scott Swan , Abbie Griffin, "Design Thinking - New Product Essentials from PDMA", Wiley, 2015.

Reference Books

1. Ulrich &Eppinger, "Product Design and Development", 3rd Edition, McGraw Hill, 2004
2. Idris Mootee, "Design Thinking for Strategic Innovation", 2013, John Wiley & Sons Inc
3. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly, 2017.
4. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam, "Introduction to Design Thinking", Tata Mc Graw Hill, First Edition,2019.

Additional / Web References

1. <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>
2. <https://nptel.ac.in/courses/110106124/>
3. <https://hbr.org/2018/09/why-design-thinking-works>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3				3							2		3	
CO 2	2	3			3							2		3	
CO 3	2		3		3							2		3	
CO 4	2		3		3							2		3	
CO 5	2			3	3							2		3	
Average	2. 5	3	3	3	3							2		3	


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Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 hours	2.5 units	100	12	24	60
CIA II	3 hours	2.5 units	100	12		
Objective Test / Online Quiz, Assignment / Case study Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
			Total		40	60




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100
200 300 400 500 600 700 800 900



III SEMESTER

23MA204	ENGINEERING MATHEMATICS - III (Common to AGRI, BME, ECE & MECH Programmes)	L 3	T 1	P 0	C 4
Category	Basic Science				
Pre requisites	Engineering Mathematics - II				

Course Objectives

The course is intended to make the students to

1. Introduce the basic concepts of probability and one-dimensional random variables.
2. Introduce the basic concepts of distribution functions.
3. Introduce the basic concepts of two-dimensional random variables
4. Introduce the effective mathematical tools for the solutions of ordinary differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.
5. Various methods of Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Solve the basic concepts of probability, conditional probability, Baye's theorem and random variables.	Apply
CO 2	Interpret the basic concepts of one dimensional random variables and standard distributions.	Apply
CO 3	Use the concepts of two dimensional random variables and analyze the relations, transformations of random variables	Apply
CO 4	Choose discrete transforms to solve different equations using z-transform.	Apply
CO 5	Use Laplace transform to solve periodic, non-periodic functions and linear differential equations.	Apply

Course Contents

Unit – I	Probability and One Dimensional Random Variables	9+3
Probability – The axioms of probability – Conditional probability – Baye's theorem - One dimensional random variable: Discrete and continuous random variables – Moments.		
Unit – II	Distributions	9+3
Discrete distributions - Binomial distribution, Poisson distribution, Geometric distribution. Continuous Distributions - Uniform distribution, Exponential distribution and Normal distribution.		
Unit – III	Two - Dimensional Random Variables	9+3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression– Transformation of random variables.		
Unit – IV	Z - Transforms	9+3
Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem – Solution of difference equations using Z - transform.		
Unit – V	Laplace Transforms	9+3
Existence conditions – Transforms of elementary functions and properties - Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.		
Total : 60 Periods		


CHAIRMAN-BOARD OF STUDIES

Text Books

- Johnson. R.A., Miller. I.R and Freund. J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
- Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill, 4th Edition, 2017.
- Grewal B.S., "Higher Engineering Mathematics", 45th Edition, Khanna Publishers, New Delhi, 2020.

Reference Books

- Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Pvt. Ltd, 10th Edition, 2021.
- Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 9th Edition, 2020.
- Ibe, O.C., "Fundamentals of Applied Probability and Random Processes ", Elsevier, 2nd Indian Reprint, 2014.

Additional / Web References

- <https://archive.nptel.ac.in/courses/111/104/111104079/>
- <https://nptel.ac.in/courses/108106151>
- <https://archive.nptel.ac.in/courses/111/106/111106139/>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	- 3
CO 1	3	2							1	1					
CO 2	3	2							1	1					
CO 3	3	2							1	1					
CO 4	3	2							1	1					
CO 5	3	2							1	1					
Average	3	2							1	1					
3 – High				2 – Medium				1 – Low				‘-’ - No Correlation			

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
			TOTAL		40	60

23ME401	ENGINEERING THERMODYNAMICS	L	T	P	C
		3	0	0	3
Category	Professional Core courses (PCC)				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Understand the basics and application of zeroth and first law of thermodynamics.
2. Impart knowledge on the second law of thermodynamics in analysing the performance of thermal devices.
3. Explore the applications of second law of thermodynamics and to learn the various properties of steam through steam tables and Mollier chart.
4. Impart knowledge on the macroscopic properties of ideal and real gases.
5. Learn the concept of gas mixtures and Psychometric processes.

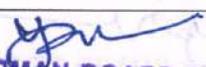
Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Interpret the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.	Understand
CO 2	Use the concept of second law of thermodynamics in the performance of thermal devices through energy and entropy calculations.	Apply
CO 3	Choose Rankine cycle to steam power plant and compare few cycle improvement methods	Apply
CO 4	Appraise simple thermodynamic relations of ideal and real gases	Analyse
CO 5	Contrast the properties of gas mixtures and moist air and its use in psychrometric processes	Analyse

Course Contents

Unit – I	Basics, Zeroth and First Law	9
Basic concepts - concept of continuum, comparison of microscopic and macroscopic approach. Path and point functions. Intensive and extensive, total and specific quantities. System and their types. Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work .P-V diagram. Zeroth law of thermodynamics – concept of temperature and thermal equilibrium–relationship between temperature scales –new temperature scales. First law of thermodynamics –application to closed and open systems – steady and unsteady flow processes.		
Unit – II	Second Law and Availability Analysis	9
Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries. Carnot cycle Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change for - pure substance, ideal gases - different processes, principle of increase in entropy. Applications of II Law. High and low grade energy. Available and non-available energy of a source and finite body. Energy and irreversibility. Expressions for the energy of a closed system and open systems. Energy balance and entropy generation. Irreversibility. I and II law Efficiency.		
Unit – III	Properties of Pure Substance and Steam Power Cycle	9


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Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles, Economiser, preheater, Binary and Combined cycles.

Unit – IV	Ideal and Real Gases, Thermodynamic Relations	9
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Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties-.Compressibility factor-.Principle of Corresponding states. -Generalised Compressibility Chart and its use-. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes. Simple Calculations.

Unit – V	Gas Mixtures and Psychometry	9
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Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing-Simple Applications.

Total :45 Periods

Text Books

1. Nag.P.K., "Engineering Thermodynamics", Tata McGraw Hill, New Delhi, 6th Edition 2017.
2. Natarajan, E., "Engineering Thermodynamics: Fundamentals and Applications", Anuragam Publications, Chennai, 2nd Edition, 2014. .

Reference Books

1. Cengel, Y and M. Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill, 9th Edition, 2019.
2. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2nd Edition, 2016.
3. Rathakrishnan, E., "Fundamentals of Engineering Thermodynamics", Prentice Hall of India Pvt. Ltd, 2nd Edition, 2023.
4. Claus Borgnakke and Richard E. Sonntag, "Fundamentals of Thermodynamics", 10th Edition, Wiley Eastern, 2019.
5. Venkatesh. A, "Basic Engineering Thermodynamics", Universities Press (India) Limited, 2007

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2	-	-	-	-	-	-	-	-	-	-	1
CO 2	3	2	2	-	-	-	-	-	-	-	-	-	-	1
CO 3	3	2	2	-	-	-	-	-	-	-	-	-	-	1
CO 4	3	2	2	-	-	-	-	-	-	-	-	-	-	1
CO 5	3	2	2	-	-	-	-	-	-	-	-	-	-	1
Average	3	2	2	-	-	-	-	-	-	-	-	-	-	1

"3"- High

"2" – Medium

"1" – low

"-" - No Correlation


CHAIRMAN-BOARD OF STUDIES

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
TOTAL			40	60		



CHAIRMAN-BOARD OF STUDIES

23ME303	ENGINEERING MECHANICS (Common to Agricultural and Mechanical Engineering Programmes)	L T P C	
Category	Engineering Sciences		
Pre requisites	-		

Course Objectives

The course is intended to

1. Understand the use of scalar and vector analytical techniques for analyzing forces in statically determinate structures
2. Familiarize the concept of equilibrium of rigid bodies, vector methods and free body diagram
3. Impart the knowledge of distributed forces, surface, loading on beam and intensity
4. Learn the principles of friction forces at the contact surfaces of various engineering systems
5. Expose to the concept of dynamic forces exerted in rigid bodies

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Interpret the techniques to find net effect in both two dimensional and three dimensional force systems on particle based approach	Understand
CO 2	Manipulate the effect of forces in a rigid body using equilibrium conditions for the given force system	Apply
CO 3	Solve the properties like centroids, area and mass moment of inertia for the given surfaces and solids	Apply
CO 4	Choose problems to compute the effect of friction in an engineering system	Apply
CO 5	Use the dynamic principles to study the motion characteristic of a given system	Apply

Course Contents

Unit – I	Statics of Particles	9
Fundamental Concepts and Principles, Systems of Units, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.		
Unit – II	Equilibrium of Rigid Bodies	9
Principle of transmissibility – Moment of force about a point – Varignon's theorem – Moment of a couple – Equivalent couple – Moment of force about an axis – Coplanar non-concurrent forces acting on rigid bodies – Resultant and equilibrium – Resolution of a given force into force couple system – Equilibrium in three dimensions – Reactions and supports, Analysis of simple truss and frames.		
Unit – III	Distributed Forces	9
Centre of gravity, Centre of mass and Centroid – Moment of Inertia of simple and complex areas – Radius of gyration – Polar moment of inertia - Mass moment of Inertia of simple solids– Product of inertia.		
Unit – IV	Friction	9
The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.		


CHAIRMAN, BOARD OF STUDIES

Unit – V	Dynamics of Particles	9
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.		
Total : 45 Hours		

Text Books

- Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, "Vector Mechanics for Engineers: Statics and Dynamics", McGraw Higher Education., 12th Edition, 2019.
- Hibbeler, R.C., "Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics", Prentice Hall, 13th edition, 2013
- Irving H. Shames, Krishna Mohana Rao G, "Engineering Mechanics – Statics and Dynamics", Pearson Education Asia Pvt. Ltd., 4th Edition, 2005.

Reference Books

- Meriam J L and Kraige L G, "Engineering Mechanics: Statics and Engineering Mechanics: Dynamics", Wiley student edition, 7th edition, 2013.
- Timoshenko S, Young D H, Rao J V and SukumarPati, "Engineering Mechanics", McGraw Hill Higher Education, 5th Edition, 2013.
- Rajasekaran S and Sankarasubramanian G, "Engineering Mechanics-Statics and Dynamics", Vikas Publishing House Pvt. Ltd., New Delhi, 2006.

Additional / Web References

- <https://nptel.ac.in/courses/122104015>
- <https://archive.nptel.ac.in/courses/112/106/112106286/>
- <https://nptel.ac.in/courses/112103109>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-
CO 2	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-
CO 3	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-
CO 4	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-
CO 5	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-
Average	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-

3 – High

2 – Medium

1 – low

“ – No Correlation


CHAIRMAN-BOARD OF STUDIES

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
TOTAL			40		60	

23ME402	ENGINEERING MATERIALS AND METALLURGY	L	T	P	C
		3	0	0	3
Category	Professional Core courses (PCC)				
Pre requisites	Physics for Engineers				

Course Objectives	
The course is intended to make the students to	
<ol style="list-style-type: none"> Understand the materials and phase diagrams, Iron-Iron carbon diagram, steel and cast irons. Summarize effect of alloying elements on ferrous and non-ferrous metals. Relate heat treatments and isothermal transformation, cooling diagrams. Discuss the properties and applications of non-metallic materials Express the mechanical properties of materials. 	

Course Outcomes (COs)		
On successful completion of the course, students will be able to		
CO. No	Course Outcome	Bloom's Level
CO 1	Classify materials and phase diagrams, Iron-Iron carbon diagram, steel and cast irons.	Understand
CO 2	Predict the effect of alloying elements on ferrous and non-ferrous metals.	Understand
CO 3	Distinguish heat treatments and isothermal transformation, cooling diagrams.	Understand
CO 4	Summarize the properties and applications of non-metallic materials	Understand
CO 5	Estimate the mechanical properties of materials.	Understand



CHAIRMAN-BOARD OF STUDIES

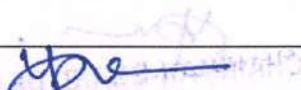
Course Contents		
Unit – I	Constitution of Alloys and Phase Diagrams	9
Introduction-Engineering Materials-Types-Properties, Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – Iron carbide equilibrium diagram. Classification of steel and cast-Iron microstructure, properties and application		
Unit – II	Ferrous and Non-Ferrous Alloys	9
Effect of alloying additions on steel (Mn, Si, Cr, Mo, Ni, V, & W) – stainless and tool steels – HSLA - Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and its alloys – Brass, Bronze and Cupro Nickel – Aluminium and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys – shape memory alloys- Properties and Applications.		
Unit – III	Heat Treatment	9
Definition – Full annealing, stress relief, recrystallisation and spheroidising –normalizing, hardening and tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram – continuous cooling Transformation (CCT) diagram – Austempering, Martempering – Hardenability, Jominy end quench test -case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening – Thermo-mechanical treatments		
Unit – IV	Non-Metallic Materials	9
Polymers – types of polymers, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PAI, PPO, PPS, PEEK, PTFE, Thermoset polymers – Urea and Phenol formaldehydes – Nylon, Engineering Ceramics – Properties and applications of Al_2O_3 , SiC , Si_3N_4 , PSZ and SIALON – Intermetallics- Composites- Matrix and reinforcement Materials applications of Composites - Nanocomposites.		
Unit – V	Mechanical Properties and Deformation Mechanisms	9
Mechanisms of plastic deformation, slip and twinning – Types of fracture – fracture mechanics- Griffith's theory- Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test Izod and Charpy, fatigue and creep failure mechanisms		
Total :45 Periods		

Text Books

1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th edition ,2018.
2. Sydney H.Avner, "Introduction to Physical Metallurgy", McGraw Hill Book Company, reprint 1994

Reference Books

1. A. Alavudeen, N. Venkateshwaran, and J. T.WinowlinJappes, A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, 1st edition, 2006.
2. Amandeep Singh Wadhwa, and Harvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Sciences Press, 1st edition, 2008.
3. G.S. Upadhyay and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt.Ltd, New Delhi, 2020.
4. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt.Ltd. 6th edition, 2019.
5. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, 2nd edition Re print 2019.


CHAIRMAN-BOARD OF STUDIES

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO 2	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO 3	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO 4	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO 5	3	2	3	-	-	-	-	-	-	-	-	-	2	-
Average	3	2	3	-	-	-	-	-	-	-	-	-	2	-

"3" – High

"2" – Medium

"1" – low

"-“ - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
TOTAL					40	60



CHAIRMAN-BOARD OF STUDIES

23ME403	MANUFACTURING PROCESSES	L 3	T 0	P 0	C 3
Category	Professional Core courses (PCC)				
Pre requisites	Nil				

Course Objectives

The course is intended to make the students to

1. Illustrate the working principles of various metal casting processes
2. Learn and apply the working principles of various metal joining processes
3. Apply the working principles of bulk deformation of metals
4. Learn the working principles of sheet metal forming process
5. Study the working principles of plastics molding and Additive manufacturing techniques

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Identify the principle of different metal casting processes	Understand
CO 2	Summarize the various metal joining processes	Understand
CO 3	Illustrate the different bulk deformation processes	Apply
CO 4	Relate the various sheet metal forming process	Apply
CO 5	Choose suitable molding technique for manufacturing of plastics components and Additive manufacturing techniques	Apply

Course Contents

Unit – I	Metal Casting Processes	9
Casting-Introduction and Applications, Sand Casting – Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Molding sand Properties and testing – Cores –Types and applications – Molding machines – Types and applications– Melting furnaces – Principle of special casting processes- Shell, investment – Ceramic mould – Pressure die casting – low pressure, gravity- Tilt pouring, high pressure die casting- Centrifugal Casting – CO ₂ casting — Defects in Sand casting process-remedies		
Unit – II	Metal Joining Process	9
Fusion welding processes – Oxy fuel welding – Filler and Flux materials—Arc welding, Electrodes, Coating and specifications – Gas Tungsten arc welding –Gas metal arc welding - Submerged arc welding – Electro slag welding– Plasma arc welding — Resistance welding Processes -Electron beam welding –Laser beam Welding Friction welding – Friction stir welding – Diffusion welding – Thermit Welding, Weld defects – inspection & remedies – Brazing - soldering – Adhesive bonding- Applications.		
Unit – III	Bulk Deformation Process	9
Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – cold forging- Characteristics of the processes – Typical forging operations – rolling of metals – Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts – Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion. Introduction to shaping operations-Applications.		
Unit – IV	Sheet Metal Process and Powder Metallurgy	9



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Sheet metal characteristics – Typical shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes - Working principle and applications – Hydroforming – Rubber pad forming – Metal spinning – Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming – Incremental forming- Powder Metallurgy – Introduction-Processing Methods - Compaction Methods - Design Consideration in Powder Metallurgy-Applications.

Unit – V	Manufacture of Plastic Components and Fundamentals of Additive Manufacturing	9
Molding of thermoplastics & thermosetting plastics– working principles and typical applications – injection molding – Plunger and screw machines – Compression molding, Transfer Molding – Typical industrial applications – introduction to blow molding – Rotational molding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics- duff moulding. Introduction to AM – Classification of AM Processes – Types of Materials Used in AM Processes- Applications.		

Total :45 Periods

Text Books

1. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India,4th Edition, 2013
2. Rao P.N., "Manufacturing Technology", McGraw Hill Education, Volume 1, 5th edition, 2018.

Reference Books

1. Roy. A. Lindberg, "Processes and materials of manufacture", PHI / Pearson education, 2006.
2. Gowri S. Hariharan P., Suresh Babu A., "Manufacturing Technology I", Pearson Education, 2008.
3. Paul Degarma E, Black J.T and Ronald A. Kosher, Eighth Edition, "Materials and Processes in Manufacturing", Eight Edition, Prentice – Hall of India, 1997.
4. Hajra Choudhary S.K and Hajra Choudhury. AK., "Elements of workshop Technology, volume I and II", Media promoters and Publishers Private Limited, Mumbai, 1997
5. Sharma, P.C., "A Textbook of Production Technology", S.Chand and Co. Ltd., 2004

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1	-	-	-	-	-	-	-	-	-	3	1
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
Average	3	2	1	-	-	-	-	-	-	-	-	-	3	1

"3" – High

"2" – Medium

"1" – low

"-" - No Correlation


CHIEF CHAIRMAN-BOARD OF STUDIES

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
TOTAL			40		60	

CHAIRMAN-BOARD OF STUDIES

23ME404	FLUID MECHANICS AND MACHINERY	L	T	P	C
		3	0	2	4
Category	Professional Core courses (PCC)				
Pre requisites	Nil				

Course Objectives

The course is intended to make the students to

1. Introduce the properties of the fluids, behaviour of fluids under static conditions
2. Interpret the dynamics of fluids and boundary layer concept
3. Expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends
4. Illustrate the significance of boundary layer theory and its thicknesses
5. Manipulate the basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Summarize the properties and behaviour in static conditions, conservation laws applicable to fluids and its application through fluid kinematics and dynamics	Understand
CO 2	Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel. Also, to understand the concept of boundary layer and its thickness on the flat solid surface.	Apply
CO 3	Illustrate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies	Apply
CO 4	Choose a suitable turbines for the given rated parameters	Apply
CO 5	Interpret a suitable centrifugal, reciprocating and rotary pumps for the real time requirements	Apply

Course Contents

Unit – I	Fluid Properties and Flow Characteristics	9
Properties of fluids – Fluid statics - Pressure Measurements - Buoyancy and floatation - Flow characteristics - Eulerian and Lagrangian approach - Concept of control volume and system - Reynold's transportation theorem - Continuity equation, energy equation and momentum equation - Applications.		
Unit – II	Flow Through Pipes and Boundary Layer	9
Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness- Basics of compressible fluid flow.		
Unit – III	Dimensional Analysis and Model Studies	9



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Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem
 - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

Unit – IV	Hydraulic Turbines	9
Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.		
Unit – V	Hydraulic Pumps	9
Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies- Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and its variations - Work saved by fitting air vessels - Rotary pumps.		Total :45 Periods
Theory - 45 Periods	Practical-30 Periods	Total-75 Periods

LIST OF EXPERIMENTS**Practical - 30 Periods**

1. Verification of Bernoulli's theorem.
2. Determination of the Coefficient of discharge of a given Orificemeter.
3. Determination of the Coefficient of discharge of a given Venturimeter.
4. Determination of the Coefficient of discharge of a given Rotameter.
5. Determination of friction factor for flow through pipes and various pipe fittings.
6. Performance characteristics of Centrifugal pump.
7. Performance characteristics of Reciprocating pump.
8. Performance characteristics of Pelton wheel turbines.

Text Books

1. Modi P.N. and Seth, S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 22nd edition, 2019.
2. Jain A. K., "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, New Delhi, 12th edition, 2014.
3. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House (p) Ltd. New Delhi, Reprint, 2016.

Reference Books

1. Fox W.R. and McDonald A.T., "Introduction to Fluid Mechanics", John-Wiley and Sons, Singapore, 8th edition, 2011.
2. Pani B S, "Fluid Mechanics: A Concise Introduction", Prentice Hall of India Private Ltd, 1st edition, 2016.
3. Cengel Y A and Cimbala J M, "Fluid Mechanics", McGraw Hill Education Pvt. Ltd., 4th edition, 2020.
4. S K Som; Gautam Biswas and S Chakraborty, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill Education Pvt. Ltd., 3rd edition, 2012.
5. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co., 8th edition, 2010.


CHAIRMAN-BOARD OF STUDIES

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	2	-	-	-	-	-	-	-	-	-	-	1
CO 2	3	3	2	-	-	-	-	-	-	-	-	-	-	1
CO 3	3	3	2	-	-	-	-	-	-	-	-	-	-	1
CO 4	3	3	2	-	-	-	-	-	-	-	-	-	-	1
CO 5	3	3	2	-	-	-	-	-	-	-	-	-	-	1
Average	3	3	2	-	-	-	-	-	-	-	-	-	-	1

"3" – High

"2" – Medium

"1" – low

"-“ - No Correlation

Assessment	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
Theory Component						
CIA I	3 hours	2.5 units	100	10	20	50
CIA II	3 hours	2.5 units	100	10		
Practical Component						
Observation & Analysis of Experimental results, Viva Voce, Quiz based on rubrics.	All Experiments	75	22.5	30	-	-
Model Exam		25	7.5			
Total					50	50


CHAIRMAN-BOARD OF STUDIES

23ME405	COMPUTER AIDED DESIGN LABORATORY	L	T	P	C
		0	0	4	2
Category	Professional Core Courses (PCC)				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Acquaint the skills and practical experience in handling 2D drafting and 3D modelling software systems, standard drawing practices using fits and tolerances
2. Prepare assembly drawings both manually and using standard CAD packages
3. Preparing standard drawing layout for modeled parts, assemblies with BoM

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Construct standard drawing layout for modelled assemblies with BoM	Apply
CO 2	Model orthogonal views of machine components	Apply
CO 3	Prepare standard drawing layout for modelled parts	Apply

Course Contents

PART I	Drawing Standards & Fits and Tolerances	12
Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits – Tolerancing of individual dimensions IS919- Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of Geometric Dimensioning & Tolerancing.		
PART II	2D Drafting & 3D Modeling	48
<ol style="list-style-type: none"> 1. Construction of 2D sketches with dimensions using a CAD tool. 2. Construction of simple 3D models with basic features using a CAD tool. 3. Construction of 3D models with advanced features such as holes, pattern, swept, and etc. using a CAD tool. 4. Develop the part drawing of a 3D model of a given machine component using a CAD tool. 5. Develop the assembly drawing of a given machine component using a CAD tool. 6. Develop the production drawing of a given machine component using a CAD tool. 7. Develop the assembly drawing of Flange coupling using a CAD tool. 8. Develop the assembly drawing of Knuckle joints using a CAD tool. 9. Develop the assembly drawing of Screw Jack using a CAD tool. 10. Simulation of Flange coupling. 		

Total :60 Periods



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Text Books													
1. Gopalakrishna K.R., "Machine Drawing", Subhas Publishers, 17th Edition, Bangalore, 2003.													
2. N. D. Bhatt and V.M. Panchal, "Machine Drawing", Charotar Publishers, 51st Edition, 2022.													
Reference Books													
1. K. L Narayana, P.Kannaiah, K.Venkata Reddy, "Machine Drawing", New Age International Publication, 15th Edition, 2016.													
2. Goutam Pohit and Goutam Ghosh, "Machine Drawing with AutoCAD", Pearson Education, 1st Edition, 2004.													
3. Junnarkar, N.D., "Machine Drawing", Pearson Education, 1st Edition, 2004													
4. Siddueshwar, N. Kanniah P., Sastri V.V.S., "Machine Drawing", Tata McGrawHill, 1st edition, 2006													
5. Trymbaka Murthy, S., "A TextBook of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 6th edition 2019.													

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	-	1	-	3	-	1	1	-	2	-	-	2	3
CO 2	2	-	1	-	3	-	1	1	-	2	-	-	2	3
CO 3	2	-	1	-	3	-	1	1	-	2	-	-	2	3
Average	2	-	1	-	3	-	1	1	-	2	-	-	2	3

"3" – High

"2" – Medium

"1" – low

"- " - No Correlation

S. No.	Assessment Method	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
1	Observation, Analysis of Experimental results & Record, Viva-voce based on rubrics.	100	7	45	40
2	Model Examination		5		
		Total	15	60	40



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23HS701	SOFT SKILLS – I (Common to all B.E/B.Tech Programmes)	L 1	T 0	P 0	C 1
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)				
Pre requisites	Nil				

Course Objectives :

The course is intended to make the students to

1. Develop communication skills and self-confidence
2. Acquire problem-solving ability and leadership skills.
3. Introduce various Techniques of Time management and decision-making skills.
4. Become effective Communicators and presentation skills.
5. Enhance their body language and workplace Etiquette.

Course Outcomes :

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Demonstrate Thinking skills, Team building.	Understand
CO 2	Express problem-solving and leadership skills	Understand
CO 3	Chose decision-making and Time Management	Apply
CO 4	Manipulate employment communication and presentation skills	Apply
CO 5	Show workplace etiquette and body language	Apply

Course Contents

Unit – I	Thinking skills and team building	3
Introduction -Core thinking skills- Categories of thinking analysis-development and human value introduction relationship behavior zones and self - self-questionnaire		
Unit – II	Problem-solving and leadership skills	3
Introduction-need for problem-solving-Skills for problem-solving-the process of problem-solving-methods of problem-solving-Importance of leadership of leadership -Styles of leadership		
Unit – III	Decision-making and time management	3
Introduction to decision making-Features of decision-making-Scope of decision-making-purpose of decision-making-Types of decision-making-process of decision-making.-Importance -Methods of Time Management		
Unit – IV	Employment communication and communication skills	3
Introduction-Writing CV-Interview skills-Formal communication and phone etiquette-Meetings Tautology-Introduction-Prerequisites of presentation-Types of presentation-Effective presentation-Presentation practices.		
Unit – V	Workplace etiquette and body language	3
Introduction-behavior at work-Personal etiquette-Travel etiquette-Binomials-Posture and stance-Emblems and gestures-Effective body language-Proxemics and haptics in body language.		
Total: 15 Periods		


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Text Books

1. Alex, K. "Soft Skills: Know Yourself and Know the World", New Delhi: S. Chand & Company Ltd., 2011.
2. Butterfield, Jeff "Soft Skills for Everyone", Delhi: Cengage Learning, 2012.
3. Apps, Judy "Voice & Speaking Skills for DUMMIES", West Sussex: John Wiley & Sons, Ltd., 2012.

Reference Books

1. Abidi, Aeda and Ritu Chaudhry, "English for Engineers", Delhi: Cengage Learning India Pvt. Ltd., 2010.
2. Manallack, Stephen, "Soft Skills for a Flat World", New Delhi: Tata McGraw Hill Education Pvt. Ltd., 2012.

Additional / Web References

1. <https://positivepsychology.com/positive-mindset/>
2. <https://www.labvanced.com/content/research/blog/2022-12-5-perception-skills-psychology/>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 2	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 3	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 4	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 5	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
Average					2				2	3		3			
1. - High				2 – Medium				1 – low				“-” - No Correlation			

Continuous Internal Assessment			End Semester Examination	Total Marks
Assessment Component		Marks		
Continuous Assessment		100	-	100




CHAIRMAN BOARD OF STUDIES



IV SEMESTER

23MA206	STATISTICS AND NUMERICAL METHODS (Common to AGRI, BME, ECE, MECH Programmes)	L	T	P	C
		3	1	0	4
Category	Basic Science(BS)				
Pre requisites	Engineering Mathematics - I & II				

Course Objectives

The course is intended to make the students to

1. Apply the necessary basic concepts of statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
2. Acquaint the knowledge of testing of hypotheses for small and large samples which plays an important role in real life problems.
3. Introduce the basic concepts of solving algebraic and transcendental equations.
4. Introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
5. Acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

Course Outcomes

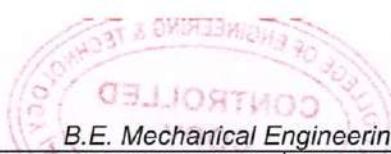
On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Choose the different samples of data at different levels of significance using various hypothesis testing.	Apply
CO 2	Construct an experiment with proper observations and measurement to get valid results using design methods.	Apply
CO 3	Identify the basic concepts of solving algebraic and transcendental equations.	Apply
CO 4	Identify the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	Apply
CO 5	Make use of various techniques and methods for solving first and second order ordinary differential equations.	Apply

Course Contents

Unit – I	Testing of Hypothesis	9+3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.		
Unit – II	Design of Experiments	9+3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design		


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Unit – III	Numerical Solution of Equations and Eigenvalue problems	9+3
Solving algebraic and transcendental equations: Newton's- Raphson method - Solutions of system of linear equations –Elimination method: Gauss elimination method and Gauss Jordan method – Iterative methods: Gauss Jacobi and Gauss Seidel Methods.		
Unit – IV	Numerical Differentiation and Integration	9+3
Numerical Differentiation: Equal intervals - Newton's forward, backward difference interpolation polynomials. Unequal Intervals - Lagrange's and Newton's divided difference interpolation polynomials. Numerical Integration: Single integration – Trapezoidal rule and Simpson's 1/3 rule- Double integration: Trapezoidal rule and Simpson's rule.		
Unit – V	Initial value problems for Ordinary Differential Equations	9+3
Single step methods: Euler's method - Fourth order Runge- Kutta method - Taylor's series method for solving first order differential equations – Multi step methods: Milne's predictor corrector methods for solving first order differential equations.		
Total : 60 Periods		

Text Books

1. Grewal, B.S, "Higher Engineering Mathematics", Khanna Publications, Delhi, 45th Edition, 2020.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

Reference Books

1. Dass, H.K., and Er. Rajnish Verma," Higher Engineering Mathematics", S. Chand Private Ltd., 2011
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 3rd Edition, 2018.
3. Burden, R.L and Faires, J.D, "Numerical Analysis Cengage Learning", 9th Edition, 2016.

Additional / Web References

1. <https://archive.nptel.ac.in/courses/103/106/103106120/>
2. <https://archive.nptel.ac.in/courses/127/106/127106019/>
3. <https://nptel.ac.in/courses/111107063>

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-


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3 – High	2 – Medium	1 – Low	‘-’ - No Correlation
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Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*	
CIA I	3 Hours	2.5 Units	100	12	24	60	
CIA II	3 Hours	2.5 Units	100	12			
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc.,			16				
(8 marks during CIA I and 8 marks during CIA II)							
TOTAL			40	60			

23ME406	THEORY OF MACHINES (Common to Mechanical and Agricultural Engineering)	L	T	P	C
		3	0	0	3
Category	Professional Core Courses (PCC)				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to

1. Applying the basic components of mechanisms, analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and design cam mechanisms for specified output motions.
2. Applying the basic concepts of toothed gearing and kinematics of gear trains
3. Analyzing the effects of friction in machine elements
4. Analyzing the characteristics of various governors and application of gyroscope principles.
5. Analyzing the undesirable effects of unbalances resulting from prescribed motions in mechanism and the effect of dynamics of undesirable vibrations.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Discuss the basics of mechanism.	Understand
CO 2	Solve problems on gears and gear trains.	Apply
CO 3	Examine friction in machine elements.	Apply
CO 4	Appraise the performance of various governors and application of gyroscope principles	Analyse



CHAIRMAN-BOARD OF STUDIES

CO 5	Infer the balancing masses and their locations of reciprocating and rotating masses. Computing the frequency of free vibration, forced vibration and damping coefficient.	Analyse
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Course Contents

Unit – I	Kinematics of Mechanisms	9
Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slider crank chain kinematics analysis in simple mechanisms – velocity and acceleration polygons– Analytical methods– cams – classifications – displacement diagrams - layout of plate cam profiles – motion of the followers.		
Unit – II	Gears and Gear Trains	9
Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – contact ratio - nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.		
Unit – III	Friction in Machine Elements	9
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes– Friction in vehicle propulsion and braking.		
Unit – IV	Governors and Gyroscopes	9
Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling force curves. Gyroscopes –Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes.		
Unit – V	Balancing and Vibration	9
Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration isolation.		
Total : 45 Periods		

Text Books

- Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, 5th edition, 2017.
- Ramamurthi. V, "Mechanics of Machines", Narosa Publishing House, 3rd edition 2009.
- Khurmi, R.S and Gupta, J.K., "Theory of Machines", S. Chand Publishing, 14th edition, 2005.

Reference Books

- Amitabha Ghosh and Asok Kumar Mallik, "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., 3rd edition, 1988.
- Rao.J.S. and Dukkipati.R.V. "Mechanism and Machine Theory", New Age International Pvt. Ltd., 2nd edition, 2014.
- Rattan, S.S, "Theory of Machines", McGraw-Hill Education Pvt. Ltd., 5th edition, 2019.
- Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 1st edition, 2017.
- Wilson and Sadler, "Kinematics and Dynamics of Machinery", Pearson, 3rd edition, 2008.


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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO 5	3	2	-	-	-	-	-	-	-	-	-	-	-	2
Average	3	2	-	-	-	-	-	-	-	-	-	-	-	2

"3"— High

"2"— Medium

"1"— low

"-—" - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
				TOTAL	40	60

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23/07/2024

23ME407	THERMAL ENGINEERING	L 3	T 0	P 0	C 3
Category	Professional Core courses (PCC)				
Pre requisites	Engineering Thermodynamics				

Course Objectives

The course is intended to

1. To learn the concepts and laws of thermodynamics to predict the operation of thermodynamic cycles and performance of Internal Combustion(IC) engines and Gas Turbines.
2. To analyzing the working of IC engines and various auxiliary systems present in IC engines
3. To analyzing the performance of steam nozzle, calculate critical pressure ratio
4. To Evaluating the performance of steam turbines through velocity triangles, understand the need for governing and compounding of turbines
5. To apply the thermodynamic concepts into various thermal application like compressors and Refrigeration and Air conditioning Systems

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Use thermodynamic concepts to different air standard cycles and solve problems.	Apply
CO 2	Summarize the functioning and features of IC engine, components and auxiliaries.	Understand
CO 3	Solve problems in steam nozzleS and turbines	Apply
CO 4	Solve problems in single stage and multistage air compressors	Apply
CO 5	Solve problems using refrigerant table / charts and psychrometric charts	Apply

Course Contents

Unit – I	Gas Power Cycles	9
Otto, Diesel, Dual, Saving fuel and money by driving sensibly, Brayton cycles, Calculation of mean effective pressure, and air standard efficiency -comparison of cycles		
Unit – II	Internal Combustion Engines	9
Classification- Components and their function. Valve timing diagram and port timing diagram- actual and theoretical p-V diagram of four stroke and two stroke engines. Simple and complete Carburettor. MPFI, Diesel pump and injector system. Battery and Magneto Ignition System- Principles of Combustion and knocking in SI and CI Engines. Lubrication and Cooling systems. Performance calculation.		
Unit – III	Steam Nozzles and Turbines	9
Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and Reaction principles, compounding, velocity diagram for simple and multi-stage turbines, speed regulations–Governors.		
Unit – IV	Air Compressor	9

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Classification and working principle of various types of compressors, work of compression with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency of reciprocating compressors, Multistage air compressor and inter cooling—work of multistage air compressor.

Unit – V	Refrigeration and Air Conditioning	9
Refrigerants- Vapour compression refrigeration cycle- superheat, sub cooling— Performance calculations- working principle of vapour absorption system, Ammonia-Water, Lithium bromide water systems (Description only). Air conditioning system- Processes, Types and Working Principles.- Concept of RSHF, GSHF, ESHF- Cooling Load calculations.		
Total :45 Periods		

Text Books

1. Kothandaraman.C.P., Domkundwar. S,Domkundwar. A.V., "A course in thermal Engineering", "Dhanpat Rai & sons ,Fifth Edition, 2016
2. Mahesh. M. Rathore, "Thermal Engineering", Tata McGraw Hill, 1st Edition,2010.
3. Rajput. R. K., "Thermal Engineering" S.Chand Publishers, 2017

Reference Books

1. Arora.C.P, "Refrigeration and Air Conditioning", Tata McGraw-Hill Publishers, 2008.
2. Ganesan V.." Internal Combustion Engines", Third Edition, Tata Mcgraw-Hill, 2012.
3. Sarkar, B.K,"Thermal Engineering" Tata McGraw-Hill Publishers, 2007
4. Rudramoorthy, R, "Thermal Engineering ",Tata McGraw-Hill, New Delhi,2003
5. Venkatesh. A, "Basic Engineering Thermodynamics", Universities Press (India) Limited, 2007

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	3	3	-	-	-	-	2	-	-	-	-	3	-	1
CO 3	3	3	-	-	-	-	-	-	-	-	-	-	-	1
CO 4	3	3	-	-	-	-	-	-	-	-	-	2	-	1
CO 5	3	3	-	-	-	-	2	-	-	-	-	3	-	1
Average	3	3	-	-	-	-	2	-	-	-	-	2	-	1

"3"— High

"2" – Medium

"1" – low

"-“ - No Correlation


CHAIRMAN-BOARD OF STUDIES

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
TOTAL			40		60	

23ME408	STRENGTH OF MATERIALS (Common to Mechanical and Agricultural Engineering)	L	T	P	C
		3	0	0	3
Category	Professional Core courses (PCC)				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to make the students to

- Understand the concepts of stress, strain, principal stresses and principal planes.
- Study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- Determine stresses and deformation in circular shafts and helical spring due to torsion.
- Compute slopes and deflections in determinate beams by various methods.
- Study the stresses and deformations induced in thin and thick shells.

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Interpret the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.	Understand
CO 2	Illustrate the shear force, bending moment and bending stresses in beams	Apply
CO 3	Choose the basic equations of torsion in designing of shafts and helical springs	Apply
CO 4	Manipulate the slope and deflection in beams using different methods.	Apply
CO 5	Solve thin and thick shells for applied pressures.	Apply



CHAIRMAN-BOARD OF STUDIES

Course Contents		
Unit – I	Stress, Strain and Deformation of Solids	9
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses - Deformation of simple and compound bars – Thermal stresses – Elastic constants - Volumetric strains – Stresses on inclined planes – Principal stresses and principal planes – Mohr's circle of stress.		
Unit – II	Transverse Loading on Beams and Stresses in Beams	9
Beams – Types - Transverse loading on beams – Shear force and Bending moment in beams – Cantilever, Simply supported and overhanging beams. Theory of simple bending – Bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.		
Unit – III	Torsion	9
Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – Combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel.		
Unit – IV	Deflection of Beams	9
Elastic curve – Governing differential equation - Double integration method - Macaulay's method – Area moment method - Conjugate beam method for computation of slope and deflection of determinate beams.		
Unit – V	Thin and Thick Cylinders	9
Stresses in thin cylindrical shells due to internal pressure - circumferential and longitudinal stresses - Deformation in thin cylinders – Spherical shells subjected to internal pressure – Deformation in spherical shells – Thick cylinders - Lame's theory.		
Total :45 Periods		
Text Books		
1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 4th edition, 2018. 2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 1st edition, 2016 3. R.S.Khurmi, "Strength of materials", S.Chand Publishers, 26th edition, 2019		
Reference Books		
1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, 2nd edition, 2019 2. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series,7 th Edition, 2011. 3. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, 10 th Edition, 2016. 4. Ferdinand P. Been, Russell Johnson, Jr. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing co. Ltd., New Delhi, 3 rd Edition, 2016.		
Additional / Web References		
1. https://nptel.ac.in/courses/112107146 2. https://nptel.ac.in/courses/112107147		



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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	2	-	-	-	-	-	-	-	-	-	-	2
CO 2	3	3	2	-	-	-	-	-	-	-	-	-	-	2
CO 3	3	3	2	-	-	-	-	-	-	-	-	-	-	2
CO 4	3	3	2	-	-	-	-	-	-	-	-	-	-	2
CO 5	3	3	2	-	-	-	-	-	-	-	-	-	-	2
Average	3	3	2	-	-	-	-	-	-	-	-	-	-	2

"3" – High

"2" – Medium

"1" – low

"-“ - No Correlation

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					16	
			TOTAL	40		60



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23HS101	UNIVERSAL HUMAN VALUES – II (Common to all B.E/B.Tech Programmes)	L 3	T 0	P 0	C 3
Category	HSMC				
Pre requisites	Universal Human Values - I				

Course Objectives

The course is intended to

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

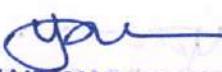
Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Associate themselves, and their surroundings (family, society, nature)	Understand
CO 2	Summarize responsibilities in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind	Understand
CO 3	Express better critical ability	Understand
CO 4	Interpret their commitments towards what they have understood (human values, human relationship and human society)	Understand
CO 5	Use what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction	Apply

Course Contents

Unit – I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	9
Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration- Continuous Happiness and Prosperity- A look at basic Human Aspirations- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority - Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.		
Unit – II	Understanding Harmony in the Human Being - Harmony in Myself!	9
Unit – III	Understanding Harmony in the Family and Society- Harmony in Human Relationship	9



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Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence –

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship - Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Unit – IV	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	9
Understanding the harmony in Nature - Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature - Understanding Existence as Coexistence of mutually interacting units in all pervasive space - Holistic perception of harmony at all levels of existence.		
Unit – V	Implications of the above Holistic Understanding of Harmony on Professional Ethics	9
<p>. Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics:</p> <p>a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations - Sum up.</p>		

Total : 45 Hours

Text Books

1. Gaur R R, Asthana R, Bagaria G P, "A Foundation Course in Human Values and Professional Ethics", Excel Books, second Revised Edition, New Delhi, 2019.
2. Gaur R R, Sangal R, Bagaria G P, "Human Values and Professional Ethics" Excel Books, New Delhi, 2010.
3. Tripathi A N, "Human Values", New Age International. Publishers, New Delhi, 2004.

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	-	-	-	-	-	3	2	3	2	-	-	2
CO 2	-	-	-	-	-	3	2	3	2	-	-	2
CO 3	-	-	-	-	-	3	2	3	2	-	-	2
CO 4	-	-	-	-	-	3	2	3	2	-	-	2
CO 5	-	-	-	-	-	3	2	3	2	-	-	2
Average	-	-	-	-	-	3	2	3	2	-	-	2
3 – High			2 – Medium			1 – low			'-' - No Correlation			



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Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	12	24	60
CIA II	3 Hours	2.5 Units	100	12		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)						
TOTAL			40		60	

23ME409	MANUFACTURING TECHNOLOGY	L	T	P	C
		3	0	2	4
Category	Professional Core courses (PCC)				
Pre requisites	Manufacturing Processes				

Course Objectives

The course is intended to

1. Study the concepts and basic mechanics of metal cutting and the factors affecting machinability
2. Learn working of basic and advanced turning machines
3. Teach the basics of machine tools with reciprocating and rotating motions and abrasive finishing processes
4. Study the basic concepts of CNC of machine tools, constructional features of CNC and learn the basics of CNC programming concepts
5. Learn the advanced machining processes and economics of machining

Course Outcomes (COs)

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Illustrate the mechanism of metal removal process and to identify the factors involved in improving machinability	Apply
CO 2	Contrast the constructional and operational features of centre lathe and other special purpose lathes	Understand
CO 3	Summarize the constructional and operational features of reciprocating machine tools	Understand
CO 4	Show the constructional features and working principles of CNC machine tools and Demonstrate the NC Program for machine tools	Apply
CO 5	Appraise the economics of machining process and estimate the significance of process parameters	Analyse



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Course Contents		
Unit – I	Mechanics of Metal Cutting	9
Mechanics of chip formation, forces in machining, Types of chip, cutting tools – single point cutting tool nomenclature, orthogonal and oblique metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.		
Unit – II	Turning Machine Tools	9
Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, surface roughness in turning, machining time and power estimation. Special lathes - Capstan and turret lathes- tool layout – automatic lathes: semi-automatic – single spindle: Swiss type, automatic screw type – multi spindle		
Unit – III	Reciprocating Machine Tools	9
Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutters– machining time calculation - Gear cutting, gear hobbing and gear shaping – gear finishing methods Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding, internal grinding - micro finishing methods		
Unit – IV	CNC Machines	9
Computer Numerical Control (CNC) machine tools, constructional details, special features – Drives, Recirculating ball screws, tool changers; CNC Control systems – Open/closed, point-to-point/continuous - Turning and machining centres – Work holding methods in Turning and machining centres, Coolant systems, Safety features-CNC Part Programming fundamentals		
Unit – V	Economics of Machining Processes	9
Economics of machining – Choice of parameters – Metal removal rates-Advanced machining processes – Introduction – Operating principles – Process parameters		
Theory :45 Periods		
Theroy-45 Periods	Practical-30 Periods	Total-75 Periods

LIST OF EXPERIMENTS**Practical-30 Periods**

1. Taper turning and Eccentric turning on circular parts using lathe machine.
2. Knurling, external and internal thread cutting on circular parts using lathe machine.
3. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
4. Cutting spur and helical gear using milling machine.
5. Generating gears using gear hobbing machine.
6. Grinding components using cylindrical and centerless grinding machine.
7. Grinding components using surface grinding machine.
8. Cutting force calculation using dynamometer in milling machine


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Text Books

1. Kalpakjian, S, "Manufacturing Engineering and Technology", Pearson Education India, 7th Edition, 2018.
2. Michael Fitzpatrick, "Machining and CNC Technology", McGraw-Hill Education; 4th edition, 2018.

Reference Books

1. Roy. A. Lindberg, "Processes and materials of manufacture", PHI / Pearson education, 4th 2006.
2. Geofrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", McGraw Hill, 3rd edition, 2005.
3. Rao. P.N "Manufacturing Technology," Metal Cutting and Machine Tools, Tata McGraw- Hill, New Delhi, 1st edition, 2009.
4. A. B. Chattopadhyay, "Machining and Machine Tools", Wiley, 2nd edition, 2017.
5. Peter Smid, "CNC Programming Handbook", Industrial Press Inc.;Third edition, 2007.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	-	-	-	-	-		2	-	-	-	3	2
CO 2	3	2	-	-	-	-	-		2	-	-	-	3	2
CO 3	3	2	-	-	-	-	-		2	-	-	-	3	2
CO 4	3	2	-	-	-	-	-		2	-	-	-	3	2
CO 5	3	2	-	-	-	-	-		2	-	-	-	3	2
Average	3	2	-	-	-	-	-		2	-	-	-	3	2

"3" – High

"2" – Medium

"1" – low

"- - No Correlation

Assessment	Duration	Syllabus to be covered	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks	
Theory Component							
CIA I	3 hours	2.5 units	100	10	20	50	
CIA II	3 hours	2.5 units	100	10			
Practical Component							
Observation & Analysis of Experimental results, Viva Voce, Quiz based on rubrics.	All Experiments	75	22 .5	30	-		
Model Exam	3 hours	25	7.5				
Total				50	50		


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23ME410	STRENGTH OF MATERIALS LABORATORY (Common to Mechanical and Agricultural Engineering)	L	T	P	C
		0	0	2	1
Category	Professional Core courses (PCC)				
Pre requisites	Engineering Materials and Metallurgy, Strength of Materials				

Course Objectives

The course is intended to

1. To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Experiment the tensile, compressive and shear properties of metals by testing	Apply
CO 2	Demonstrate the hardness properties and impact strength of metals by testing	Apply
CO 3	Show the shear force, bending moment and bending stresses in beams	Apply
CO 4	Use torsion equation in design of circular shafts	Apply
CO 5	Experiment the stiffness properties of helical and carriage spring	Apply

S.No	List of Exercises	CO	Blooms Taxonomy
1	Tension test on steel rod	CO 1	Apply
2	Compression test on wood	CO 1	Apply
3	Double shear test on metal	CO 1	Apply
4	Hardness test on metals (Rockwell and Brinell Hardness Tests)	CO 2	Apply
5	Impact test on metal specimen (Izod and Charpy)	CO 2	Apply
6	Deflection test on metal beam	CO 3	Apply
7	Torsion test on mild steel rod	CO 4	Apply
8	Compression test on helical spring	CO 5	Apply
9	Tension test on helical spring	CO5	Apply
Total : 30 Periods			



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Reference Books

Manual-prepared by SSCET

Additional References

- Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
- IS1786-2008 (Fourth Revision, Reaffirmed 2013), 'High strength deformed bars and wires for concrete reinforcement – Specification', 2008.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	2	-	-	-	-	-	3	-	-	-	-	2
CO 2	3	3	2	-	-	-	-	-	3	-	-	-	-	2
CO 3	3	3	2	-	-	-	-	-	3	-	-	-	-	2
CO 4	3	3	2	-	-	-	-	-	3	-	-	-	-	2
CO 5	3	3	2	-	-	-	-	-	3	-	-	-	-	2
Average	3	3	2	-	-	-	-	-	3	-	-	-	-	2

"3" – High

"2" – Medium

"1" – low

"- " - No Correlation

S. No.	Assessment Method	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
1	Observation, Analysis of Experimental results & Record, Viva-voce based on rubrics.	100	75	45	40
2	Model Examination	100	25	15	
Total				60	40



CHAIRMAN-BOARD OF STUDIES

23ME411	THERMAL ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2
Category	Professional Core courses (PCC)				
Pre requisites	23ME407				

Course Objectives

The course is intended to

1. To study the valve and port timing diagram and performance characteristics of IC engines
2. To Study the characteristics of fuels/Lubricates used in IC Engines
3. To study the Performance of Compressor
4. To study the Performance of steam generator/ turbine
5. To study the Performance of refrigeration cycle / components

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Conduct tests to evaluate performance characteristics of IC engines	Apply
CO 2	Understand the properties of Lubrication oil	Understand
CO 3	Understand the concept of steam nozzles and waste heat recovery system	Understand
CO 4	Conduct tests to evaluate Performance and Energy Balance on a Steam Generator.	Apply
CO 5	Conduct tests to evaluate the performance of refrigeration cycle and Compressor	Apply

S.No	List of Exercises	CO	Blooms Taxonomy
1.	Experimental study on port timing and valve timing diagram of IC engines.	CO 1	Understand
2.	Experimental study on performance test of 4-Stroke diesel engine.	CO 1	Apply
3.	Experimental study on heat balance test of 4-Stroke diesel engine.	CO 1	Apply
4.	Experimental study on performance test of 4-Stroke Petrol engine.	CO 1	Apply
5.	Morse test on multi-cylinder petrol engine.	CO 1	Apply
6.	Determination of Flash Point and Fire Point of various fuels / lubricants	CO2	Understand
7.	Study of steam nozzles and waste heat recovery systems.	CO 3	Apply
8.	Study of Steam Generators and Turbines.	CO 4	Apply
9.	Experimental study on performance of two stage reciprocating air compressor.	CO 5	Apply
10.	Experimental study on determination of Coefficient of Performance of refrigeration.	CO 5	Apply



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11.	Experimental study on determination of Coefficient of Performance of Air-conditioning system.	CO 5	Apply
Total : 30 Periods			

Reference Books

1. Manual-prepared by SSCET

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	2	-	-	-	-	-	-	1	-	-	3	-	-
CO 2	2	2	-	-	-	-	-	-	1	-	-	3	-	-
CO 3	2	2	-	-	-	-	-	-	1	-	-	3	-	-
CO 4	2	2	-	-	-	-	-	-	1	-	-	3	-	-
CO 5	2	2	-	-	-	-	-	-	1	-	-	3	-	-
Average	2	2	-	-	-	-	-	-	1	-	-	3	-	-

"3" – High

"2" – Medium

"1" – low

"- - No Correlation

S. No.	Assessment Method	Max. Marks	Weightage for Internal Marks	Continuous Internal Assessment Marks	End Semester Examination Marks
1	Observation, Analysis of Experimental results & Record, Viva-voce based on rubrics.	100	75	45	40
2	Model Examination	100	25	15	
Total				60	40



REDDY CHAIRMAN-BOARD OF STUDIES

23HS702	SOFT SKILLS – II (Common to all B.E/B.Tech Programmes)	L 1	T 0	P 0	C 1
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)				
Pre requisites	Soft Skills-I				
Course Objectives					

The course is intended to

1. help students develop communication skills and self-confidence
2. motivate students to acquire employability skills
3. introduce various interview techniques to students and guide them to tackle interviews
4. motivate students to become effective public speakers and develop leadership qualities in them
5. help students enhance their writing skills

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Express the art of speaking	Understand
CO 2	Interpret body language effectively	Understand
CO 3	Develop optimistic attitude to cope in organisations	Apply
CO 4	Prepare professionally by improving perception	Apply
CO 5	Organise good etiquette and manners	Apply

Course Contents

Unit – I	Art of Speaking	3
Emphasizing S in LSRW, Defining communication, special features and importance of communication, types of communication networks, art of public speaking		
Unit – II	Body Language	3
Paralinguistic features, origin & uses of body language, improving and interpreting body language		
Unit – III	Developing Positive Attitude	3
Features and power of attitudes, attitude and behavior, ways of changing attitude in a person, attitude in workplace, positive attitude and its results, overcoming negative attitude		
Unit – IV	Improving Perception	3
Factors influencing perception, perceptual process, perception and its application in organisations and group discussion		
Unit – V	Etiquette and Manners	3
Modern etiquette, benefits and classification of etiquette, importance of good manners, professional manners		
Total : 15 Periods		


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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 2	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 3	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 4	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
CO 5	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
Average	-	-	-	-	2	-	-	-	2	3	-	3	-	-	-
3 – High	2 – Medium	1 – low											'-' - No Correlation		

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
Written Test	3 Hours	5 Units	100	50	50	
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc.,					50	
(marks during CIA I and 8 marks during CIA II)						
			TOTAL	100		



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23MC802	ENVIRONMENTAL SCIENCES AND DISASTER MANAGEMENT (Common to all B.E/B.Tech Programmes)	L	T	P	C
		2	0	0	0
Category	Mandatory course				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Study about Environment and Biodiversity.
2. Basic knowledge and concept of causes, effects and control of different types of environmental pollution.
3. Knowledge and concept of renewable sources of energy.
4. Exposure to natural and man-made disasters.
5. Understand the relationship between vulnerability, disasters, and disaster prevention.

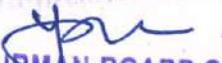
Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Demonstrate the components of Environment and Biodiversity.	Understand
CO 2	Outline the source of various pollution and its control measures.	Understand
CO 3	Infer the various source of renewable energy and emphasis.	Understand
CO 4	Relate the types of disasters, causes and their impact on environment and society.	Understand
CO 5	Use various methods of risk reduction measures in disaster.	Apply

Course Contents

Unit – I	Environment and Biodiversity	6
Definition, scope and importance of environment – need for public awareness. Types of biodiversity: genetic, species and ecosystem diversity – India as a mega-diversity nation – endemic and endangered species of India - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – conservation of biodiversity: In-situ and ex-situ.		
Unit – II	Environmental Pollution	6
Causes, Effects and Preventive measures of Water, Soil and Air Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.		
Unit – III	Renewable Sources of Energy	6
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.		
Unit – IV	Natural and Man Made Disaster	6
Natural Disaster: such as Tsunami, volcanic eruptions, Flood, Cyclone, Earthquakes, continental drift and Landslides. Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road) - Causes, effects and practical examples for all disasters.		
Unit – V	Disaster Management	6
Concept of disaster management, Effect to migrate natural disaster at National and global levels, International strategy for disaster reduction, Financial arrangements: Role of NGOs and media. Central, State, District and local administration, NDRC and Armed forces in disaster response.		
		Total : 30 Hours


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Text Books

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2016.
3. Shrivastava. A. K, "TextBook of Disaster management", I edition, Scientific Publishers, 2024.

Reference Books

1. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, Third Edition, 2015.
2. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.
3. "Disaster Management Act", Government of India, New Delhi, 2005.

Additional / Web References

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	-	-	-	-	-	2	3	2	-	-	-	2
CO 2	-	-	-	-	-	2	3	2	-	-	-	2
CO 3	-	-	-	-	-	2	3	2	-	-	-	2
CO 4	-	-	-	-	-	2	3	2	-	-	-	2
CO 5	-	-	-	-	-	2	3	2	-	-	-	2
Average	-	-	-	-	-	2	3	2	-	-	-	2
3 – High			2 – Medium			1 – low			'-' - No Correlation			

Assessment Components	Duration	Syllabus to be covered	Max. Marks	Weightage for internal marks	Continuous Internal Assessment Marks	End Semester Examination Marks*
CIA I	3 Hours	2.5 Units	100	25	50	
CIA II	3 Hours	2.5 Units	100	25		
Objective Test / Online Quiz, Assignment / Case study , Seminar / Tutorial, Role Play, Poster Presentation, Group Discussions, Oral Presentation, Mini Project etc., (8 marks during CIA I and 8 marks during CIA II)					50	
					TOTAL	100
						-




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