B.E. Degree

in

MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS (CBCS)

(For students admitted from the Academic Year 2022-2023)

DEPARTMENT OF MECHANICAL ENGINEERING

St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING

CHUNKANKADAI, NAGERCOIL – 629 003.

KANYAKUMARI DISTRICT, TAMIL NADU, INDIA

Vision

To be an institution of eminence of optimal human development, excellent engineering education and pioneering research towards developing a technically-empowered humane society.

Mission

To transform the (rural) youth into top class professionals and technocrats willing to serve local and global society with ethical integrity, by providing vibrant academic experience of learning, research and innovation and stimulating opportunities to develop personal maturity and professional skills, with inspiring and high caliber faculty in a quality and serene infrastructural environment.

Inconsonance to the vision of our College,

An engineering graduate we form would be a person with optimal human development, i.e. physical, mental, emotional, social and spiritual spheres of personality.

He/she would be also a person mature in relationships, especially knowing how to treat everyone with respect, including persons of complementary gender with equality and gender sensitivity guided by clear and pro-social values.

He would be patriotic and would hold the Indian Constitution and all the precepts it outlays close to his heart and would have a secular spirit committed to safeguard and cherish the multi-cultural, multi-religious and multi-linguistic ethos of Indian Society.

Academically, he/she would be a graduate with a strong engineering foundation with proficient technical knowledge and skills. He would have enough exposure and experience into the ethos of relevant industry and be industry ready to construct a successful career for himself and for the benefit of the society.

He would have been well trained in research methodology and would have established himself as a researcher having taken up many research projects, with sound ethical standards and social relevance. He would be a person with a passion for technical innovations committed to lifelong learning and research.

He would be well prepared and confident to develop ingenuous solutions to the problems people face as an individual and as a team and work for the emancipation of our society with leadership and courage.

The curriculum incorporates the necessary mechanical engineering fundamentals, advanced technologies, communication and management skills required to solve local, global needs with ethical and society concern. The curriculum shows a close alignment with the program outcome and the program specific outcome. In which, the various courses impart in the curriculum shall inculcate deep knowledge and skills required for a mechanical engineer. The curriculum learning

outcomes result successful mechanical engineering professionals with excellent skills as that focused by the program outcome and program specific outcome. The pupil transformation through the curriculum will show a good degree of coherence with the college mission and vision, creating young vibrant technocrats for global society with ethical values.

I. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I	Have ability to understand, analyse and solve real case problems in core mechanical engineering as well as in other allied fields.
II	Have ability to adapt well into career in mechanical related Industries and to perceive higher studies.
III	Contribute for R&D efforts in technological development to meet international standards and future needs.
IV	Provide leadership skill by upholding ethical values with social responsibility.
V	Assimilate with the spirit of entrepreneurship and innovation.

II. PROGRAM OUTCOMES (POs)

PO #	Graduate Attribute
1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**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.
3	**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.
4	**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.

5	**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.
6	**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.
7	**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.
8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**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.
11	**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.
12	**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.

III. **PROGRAM SPECIFIC OUTCOMES (PSOs)** On successful completion of the Mechanical Engineering Degree programme, the Graduates shall exhibit the following:

PSO1	Ability to utilize state-of-art IT tools to analyse, design and evaluate mechanical components.
PSO2	Ability to design and evaluate the performance of thermal systems and execute processes to manufacture various components and systems with quality assurance.
PSO3	Ability to apply modern management techniques with a concern for environment upholding ethical values.

PEO's – PO's & PSO's MAPPING:

PEO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	3	3	3	3	1	-	-	-	1	2	1	1	3	3	1
II	3	3	2	2	2	2	2	3	3	2	2	2	2	3	2
III	3	3	3	3	3	2	2	-	2	2	2	3	3	3	2
IV	2	-	-	-	-	3	2	3	2	2	3	2	-	-	3
V	3	3	3	1	1	-	-	-	1	2	3	3	2	2	1

PROGRAM ARTICULATION MATRIX

Year	Sem	Course Code	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	EN22101	-	-	-	-	-	-	-	-	2	2	-	2	1	-	-
		MA22101	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
		PH22101	2	1	-	-	-	-	-	-	-	-	-	1	2	2	-
		CH22101	3	2	2	1	-	-	2	-	-	-	-	1	-	1	1
		CS22101	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
		HS22101	3	2	2	1	-	-	2	-	2	-	1	1	-	-	-
		HS22102	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-
		CS22102	3	3	3	3	2	-	-	-	-	-	-	1	3	-	-
		BS22101	3	1	-	-	-	2	2	-	2	1	-	1	-	-	-
I	II	EN22201	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
		MA22201	3	2	-	-	-	-	-	-	-	-	-	1	-	2	-
		PH22204	2	1	-	-	-	-	-	-	2	1	-	1	-	2	-
		ES22202	3	2	2	2	-	-	-	-	-	-	-	1	1	-	-
		CH22201	3	2	2	2	-	-	-	-	-	-	-	1	-	-	2
		ME22201	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
		ME22202	3	3	2	2	-	-	-	-	-	1	-	2	-	2	-
		ME22203	1	-	-	-	2	-	-	-	1	1	-	1	2	-	-
		ES22203	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
II	III	MA22304	3	2	1	-	-	-	-	-	-	-	-	-	1		
		ME22301	3	2	2	-	-	-	-	-	-	1	-	1	-	2	-
		ME22302	3	2	2	-	-		-	-	-	2	1	1	-	2	-
		ME22303	3	2	2	-	-	-	-	-	-	-	-	1	1	2	-
		EE22308	3	2	2		-	-	-	-	2	1	-	1		2	-
		ME22304	3	1	-	-	-	-	1	-	1	1	-	1	1	1	
II	IV	ME22401	3	2	2	1	-	-	-	-	2	1	-	1	1	2	-
		ME22402	3	2	2	-	-	-	-	-	2	1	-	2	2	1	-
		ME22403	3	2	3	2	-	-	1	-	-	1	-	2		2	1
		ME22404	3	2	2	1	2	-	-	1	1	1	-	1	3	-	1
		ME22405	2	2	2	3	2	-	-	2	2	2	-	1	3	2	1

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MA22101	Matrices and Calculus	BSC	3	1	0	4	4
2	PH22101	Engineering Physics	BSC	3	0	0	3	3
3	CH22101	Engineering Chemistry	BSC	3	0	0	3	3
4	CS22101	Problem Solving and Python Programming	ESC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5	EN22101	Communicative English	HSMC	2	0	2	4	3
PRACTICAL COURSES								
6	BS22101	Physics – Chemistry Laboratory	BSC	0	0	4	4	2
7	CS22102	Python Programming Laboratory	ESC	0	0	4	4	2
MANDATORY COURSES								
8	IP22101	Induction Programme	-	-	-	-	-	0
9	CS22101	Higher Order thinking	MC	1	0	0	1	1
10	HS22102	Universal Human Values: Understanding Harmony and Ethical Human Conduct	HSMC	2	0	0	2	2
TOTAL				**17**	**1**	**10**	**28**	**23**

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MA22201	Statistics and Numerical Methods	BSC	3	1	0	4	4
2	ES22202	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
3	ME22201	Engineering Graphics	ESC	2	0	2	4	3
4	ME22202	Engineering Mechanics	PCC	2	1	0	3	3
5	GE3152	தமிழர் மரபு (Heritage of Tamil)	HSMC	1	0	0	1	1
THEORY COURSES WITH PRACTICAL COMPONENT								
6	EN22201	Technical English	HSMC	2	0	2	4	3
7	PH22204	Material Science	BSC	2	0	2	4	3
8	CH22201	Environment and Sustainability	BSC	2	0	2	4	3
PRACTICAL COURSES								
9	ME22203	Computer Aided design and Drafting Laboratory	PCC	0	0	4	4	2
10	ES22203	Engineering Practices Laboratory	ESC	0	0	4	4	2
TOTAL				**17**	**2**	**16**	**35**	**27**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	MA22304	Transforms and partial differential equations	BSC	3	1	0	4	4
2	ME22301	Engineering Thermodynamics	PCC	3	1	0	4	4
3	ME22303	Manufacturing Process	PCC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
4	ME22302	Fluid Mechanics and Machinery	PCC	3	0	2	5	4
5	EE22308	Electrical drives and control	PCC	3	0	2	5	4
PRACTICAL COURSES								
6	ME22304	Manufacturing Process Laboratory	PCC	0	0	4	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
7	SD22301	Coding Skills and Soft Skills Training – Phase I	EEC	0	0	4	4	2
MANDATORY COURSES								
8	AC22301	Constitution of India	MC	2	0	0	2	0
9	HS22301	Value Education - I	MC	1	0	0	1	0
10	GE3252	Tamils and Technology	HSMC	1	0	0	1	1
TOTAL				**19**	**2**	**12**	**33**	**24**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	ME22403	Engineering Materials and Metallurgy	PCC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
2	ME22401	Thermal Engineering	PCC	2	1	2	5	4
3	ME22402	Strength of Materials	PCC	2	1	2	5	4
4	ME22404	Mechanics of Machines	PCC	2	1	2	5	4
5	ME22405	Metrology and Measurements	PCC	3	0	2	5	4
EMPLOYABILITY ENHANCEMENT COURSES								
6	SD22401	Coding Skills and Soft Skills Training – Phase II	EEC	0	0	4	4	2
MANDATORY COURSES								
7	AC22401	Industrial Safety Engineering	MC	2	0	0	2	0
TOTAL				**14**	**3**	**12**	**29**	**21**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	ME22502	Design of Machine Elements	PCC	2	1	0	3	3
2	ME22503	Hydraulics and Pneumatics	PCC	3	0	0	3	3
3		Professional Elective I	PEC	3	0	0	3	3
4		Professional Elective II	PEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
5	ME22501	Heat Transfer	PCC	2	1	2	5	4
EMPLOYABILITY ENHANCEMENT COURSES								
6	SD22501	Coding Skills and Soft Skills Training – Phase III	EEC	0	0	4	4	2
7	ME22504	Technical Seminar	EEC	0	0	2	2	1
8	ME22505	Inplant / Industrial Training (2 weeks - During 4^{th} semester Summer Vacation)	EEC	-	-	-	-	1
MANDATORY COURSES								
9	AC22501	Entrepreneurship Development	MC	2	0	0	2	0
10	HC22501	Value Education - II	MC	1	0	0	1	0
TOTAL				**16**	**2**	**8**	**26**	**20**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE - GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	HS22601	Professional Ethics	HSMC	3	0	0	3	3
2	ME22602	Finite Element Analysis	PCC	3	0	0	3	3
3		Open Elective – I	OEC	3	0	0	3	3
4		Professional Elective III	PEC	3	0	0	3	3
5		Professional Elective IV	PEC	3	0	0	3	3
THEORY COURSES WITH PRACTICAL COMPONENT								
6	ME22601	Mechatronics	PCC	3	0	2	5	4
PRACTICAL COURSES								
7	ME22604	CAD/CAM laboratory	PCC	0	0	4	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
8	SD22601	Coding Skills, Logical Reasoning and Quantitative Aptitude Training – Phase I	EEC	0	0	4	4	2
TOTAL				**18**	**1**	**10**	**28**	**23**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY COURSES								
1	ME22701	Total Quality Management	HSMC	3	0	0	3	3
2		Professional Elective V	PEC	3	0	0	3	3
3		Professional Elective VI	PEC	3	0	0	3	3
4		Open Elective – II	OEC	3	0	0	3	3
5		Open Elective – III	OEC	3	0	0	3	3
PRACTICAL COURSES								
6	ME22702	Simulation and Analysis laboratory	PCC	0	0	4	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
7	ME22703	Product development Lab/ Mini project	EEC	0	0	6	6	2
8	SD22701	Coding Skills, Logical Reasoning and Quantitative Aptitude Training – Phase II	EEC	0	0	4	4	2
TOTAL				**15**	**-**	**14**	**29**	**21**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
EMPLOYABILITY ENHANCEMENT COURSES								
1	ME22801	Internship/ Project	EEC	0	0	16	16	8
TOTAL						**16**	**16**	**8**

SUMMARY

B.E. Mechanical Engineering										
Sl. No.	**Subject Area**	**Credits per Semester**								**Total Credits**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
1	**HSMC**	5	4	1			3	3		16
2	**BSC**	12	10	4						26
3	**ESC**	6	8							14
4	**PCC**		5	17	19	10	9	2		62
5	**PEC**					6	6	6		18
6	**OEC**						3	6		9
7	**EEC**			2	2	4	2	4	8	22
8	**Non-Credit /(Mandatory)**	1 course		2 course	1 course	2 course	-	-		-
Total		23	27	24	21	20	23	21	8	167

PROFESSIONAL ELECTIVE COURSES

LIST OF IDENTIFIED VERTICALS	
1	THERMAL SCIENCES
2	ENGINEERING DESIGN & MANUFACTURING
3	GREEN ENERGY TECHNOLOGIES
4	DIGITAL MANUFACTURING
5	ELECTRIC VEHICLE TECHNOLOGY
6	COMPUTATIONAL ENGINEERING

VERTICAL 1: THERMAL SCIENCES

Sl. No.	Course code	Course title	Categ-ory	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	ME22511	Advanced Internal Combustion Engineering	PEC-1	3	0	0	3	3
2.	ME22512	Refrigeration and Air-conditioning	PEC-2	3	0	0	3	3
3.	ME22611	Gas Dynamics and Jet Propulsion	PEC-3	3	0	0	3	3
4.	ME22711	Turbo Machines	PEC-6	3	0	0	3	3
5.	ME22712	Measurements and Controls	PEC-7	3	0	0	3	3
6.	ME22612	Power plant Engineering	PEC-4	3	0	0	3	3

VERTICAL 2: ENGINEERING DESIGN & MANUFACTURING

Sl. No.	Course code	Course title	Categ ory	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	ME22513	Process Planning and Cost Estimation	PEC-1	3	0	0	3	3
2.	ME22514	Design of Transmission System	PEC-2	3	0	0	3	3
3.	ME22613	Design of Jigs, Fixtures and Press Tools	PEC-3	3	0	0	3	3
4.	ME22614	Non-traditional Machining Processes	PEC-4	3	0	0	3	3
5.	ME22713	Computer Integrated Manufacturing	PEC-5	3	0	0	3	3
6.	ME22714	Production Planning and Control	PEC-6	3	0	0	3	3

VERTICAL 3: GREEN ENERGY

Sl. No.	Coursecode	Course title	Cate gory	Periods Per week			Total contact periods	Credits
				L	T	P		
1	ME22515	Bioenergy Conversion Technologies	PEC-1	3	0	0	3	3
2	ME22516	Carbon footprint estimation and reduction techniques	PEC-2	3	0	0	3	3
3	ME22615	Energy conservation in Industrial utilities	PEC-3	3	0	0	3	3
4	ME22715	Energy storage devices	PEC-4	3	0	0	3	3
5	ME22716	Renewable Energy Technologies	PEC-5	2	0	2	3	3
6	ME22616	Energy efficient Buildings	PEC-6	3	0	0	3	3

VERTICAL 4: DIGITAL MANUFACTURING

Sl. No.	Course code	Course title	Cate gory	Periods Per week			Total contact periods	Credits
				L	T	P		
1	ME22517	Digital Manufacturing and IOT	PEC-1	3	0	0	3	3
2	ME22518	Robot Design, Dynamics and Control	PEC-2	3	0	0	3	3
3	ME22617	Sensors, Actuators and controllers for Automation	PEC-3	3	0	0	3	3
4	ME22618	3D Printing process and Applications	PEC-4	2	0	2	5	3
5	ME22717	Lean Manufacturing	PEC-5	3	0	0	3	3
6	ME22718	Non Destructive Testing	PEC-6	3	0	0	3	3

VERTICAL 5: ELECTRIC VEHICLE TECHNOLOGY

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	ME22519	Advanced Vehicle Engineering	PEC-2	3	0	0	3	3
2.	ME22520	Electric vehicles and Power Management	PEC-3	3	0	0	3	3
3.	ME22619	Vehicle maintenance and safety	PEC-5	3	0	0	3	3
4.	ME22620	Autonomous & Electric Vehicle Technology	PEC-6	3	0	0	3	3
5.	ME22719	Hybrid and Electric Vehicle Technology	PEC-7	3	0	0	3	3
6.	ME22720	Battery technologies for Electric Vehicles	PEC-8	3	0	0	3	3

VERTICAL 6: COMPUTATIONAL ENGINEERING

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1	ME22521	Computational Solid Mechanics	PEC-1	3	0	0	3	3
2	ME22522	Computational Fluid Dynamics and Heat transfer	PEC-2	3	0	0	3	3
3	ME22621	Computational Bio-Mechanics	PEC-4	3	0	0	3	3
4	ME22622	Computer Aided Inspection	PEC-5	3	0	0	3	3
5	ME22721	CAD and CAE	PEC-6	2	0	2	4	3
6	ME22722	Machine Learning for Intelligent Systems	PEC-8	3	0	0	3	3

OPEN ELECTIVE

Sl. No.	Course code	Course title	Category	Periods Per week			Total contact periods	Credits
				L	T	P		
1.	ME22O01	Energy Conservations in Industrial Utilities	OEC-1	3	0	0	3	3
2.	ME22O02	Composite Materials and Mechanics	OEC-2	3	0	0	3	3
3.	ME22O03	Power Plant Engineering	OEC-3	3	0	0	3	3
4.	ME22O04	Industrial Robotics	OEC-4	3	0	0	3	3
5.	ME22O05	Automotive Technologies	OEC-5	3	0	0	3	3

SYLLABUS

Semecter-I

EN22101	COMMUNICATIVE ENGLISH	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To guide the learners on the basics of language including vocabulary and grammar
- To develop the receptive skills of the learners: Reading and Listening
- To develop the productive skills of the learners: Writing and Speaking
- To make the learners realize the importance of accuracy and fluency
- To help the learners use the language in real situations

UNIT I VOCABULARY AND LANGUAGE STUDY **6**

Vocabulary – Synonyms and Antonyms, Word building – Prefixes and Suffixes – Word formation- Definitions - One word substitutes - Reading for vocabulary and language development- Note making and Summarising - Developing Hints.

UNIT II READING AND LANGUAGE DEVELOPMENT **6**

Parts of speech, Types of sentences – Statement, Interrogative, Imperative, Exclamatory, Wh-questions, **Yes** or **No** questions and tag questions, Formal Letters – Academic, Official, and Business Letters

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT **6**

Tense and Voice, Auxiliary verbs (be, do, have), Modal verbs - *Types of Reading* : Intensive Reading and Extensive Reading- *Strategies*: Predicting- Skimming and Scanning -Reading for facts - Understanding the parts of paragraph- Learning the transitional signals used in the passage to classify the text

UNIT IV FUNDAMENTALS OF WRITING **6**

Punctuation and Capitalization- **Sentence formation**: Word order-Completion of sentences-Conjunctions-Transitional signals- sentence and sentence structures- Informal Letters.

UNIT V EXTENDED WRITING **6**

Degrees of Comparison – Reported speech **-Paragraph writing**-Topic sentence, supporting sentences and concluding sentence-Informal and Formal expressions

TOTAL : 30 PERIODS

PRACTICAL EXERCISES

Listening (Receptive skill**)** *Intensive Listening: Effective and Attentive Listening*

Exercises

1) Listening for gist from recorded speeches

2) Listening for specific information from recorded conversations
3) Listening for strengthening vocabulary skills.
4) Listening to variety of situations and voices- Listening for language development
5) Listening for pronunciation: syllables, stress and intonation.

Speaking (Productive Skill)

Exercises

1) Introducing oneself and others
2) Asking for / giving personal information
3) Practicing dialogues in pairs
4) Giving directions-Informal and formal dialogues
5) Speaking in connected speech
6) Responding to questions
7) Short presentations
8) Speaking in small and big groups
9) Learning and practicing the essential qualities of a good speaker

TOTAL: 30 PERIODS
TOTAL(T+P): 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Apply and practice the correct usages of language
CO2: Receive the language effectively and meaningfully through receptive skills
CO3: Produce the language appropriate to the needs and situations exercising productive skills
CO4: Transfer or interpret any piece of information with accuracy and fluency
CO5: Apply the language intellectually and confidently

TEXT BOOKS:

1. Shobha. K.N, Rayen, Joavani, Lourdes, "Communicative English", Cambridge University Press, 2018.
2. Sudharshana.N.P and Saveetha. C, "English for Technical Communication", Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Kumar, Suresh. E., "Engineering English", Orient Blackswan, Hyderabad, 2015.
2. Means, L. Thomas and Elaine Langlois, "English & Communication for Colleges", Cengage Learning, USA: 2007.
3. Greendaum, Sydney and Quirk, Randolph, "A Student's Grammar of the English Language", Pearson Education.
4. Wood F.T, "Remedial English Grammar", Macmillan, 2007.

Course outcomes	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	-	-	-	1	1	-	2	1	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	2	1	-	-
CO3	-	-	-	-	-	-	-	-	1	1	-	2	1	-	-
CO4	-	-	-	-	-	-	-	-	2	2	-	2	1	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	2	1	-	-
CO	-	-	-	-	-	-	-	-	2	2	-	2	1	-	-

MA22101 MATRICES AND CALCULUS L T P C
3 1 0 4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications
- To familiarize the students with differential calculus
- To familiarize the student with functions of several variables. This is needed in many branches of engineering
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications
- To make the students understand various techniques ODE

UNIT I MATRICES **12**

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Problem solving using Cayley-Hamilton method – Orthogonal transformation of a symmetric matrix to Diagonal form – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature, rank, index.

UNIT II DIFFERENTIAL CALCULUS **12**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules: sum, product, quotient, chain rules - Implicit differentiation – Logarithmic differentiation – Applications: Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **12**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals – Double integrals in Cartesian and polar coordinates –Area enclosed by plane curves - Change of order of integration – Triple integrals – Volume of solids: cube, rectangular parallelopiped.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12

Linear differential equations of second and higher order with constant coefficients when the R.H.S is e^{ax}, x^n , sin ax, cos ax, $e^{ax}x^n$, e^{ax} sinbx, e^{ax} cosbx – Linear differential equations of second and third order with variable coefficients: Cauchy's and Legendre's linear equations – Method of variation of parameter .

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Define the basic concepts of matrices, limit and continuity of a function, differentiation, ODE and integration

CO2: Explain the properties of matrices and nature of the quadratic form

CO3: Interpret the techniques of differentiation, partial differentiation, ODE and integration

CO4: Apply diagonalization of matrices in quadratic form and apply Cayley Hamilton theorem to find the inverse of matrices

CO5: Solve problems on differentiation, partial differentiation, integration and ODE using different methods

TEXT BOOKS:

1. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
2. Narayanan, S. and ManicavachagomPillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, Reprint 2017.
3. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition,2014.

REFERENCES:

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
4. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall

Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
5. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
6. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-

PH22101 ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology
- To help the students to interrelate the topics such as properties of matter, thermal physics, ultrasonics, quantum theory and crystals, learned in the course
- To motivate students to compare and contrast the available equipment in the respective fields
- To induce the students to design new devices that serve humanity by applying the knowledge gained during the course

UNIT I PROPERTIES OF MATTER **9**

Elasticity – Types of Elastic moduli – Factors affecting elasticity - Stress-strain diagram and its uses - beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: determination of young's modulus – I shaped Girders - twisting couple - torsion pendulum: determination of rigidity modulus and moment of inertia – torsion springs - other

states of matter

UNIT II THERMAL PHYSICS 9

Modes of Heat transfer – Thermal conductivity – Newton's law of cooling – Linear heat flow – Thermal conductivity in compound media - Lee's Disc method – Radial heat flow – Rubber tube method – Solar water heater - Thermodynamics – Isothermal and adiabatic process – Otto cycle – Diesel cycle

UNIT III ULTRASONICS 9

Sound waves – ultrasonics – properties - production: magnetostriction method - piezoelectric method – cavitation - acoustic grating: wavelength and velocity of ultrasonic waves in liquids – applications: welding, machining, cleaning, soldering and mixing (qualitative) - SONAR – ultrasonic flaw detector - ultrasonography.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's radiation law – Deduction of Wien's displacement law and Rayleigh Jean's law - Compton effect, Photoelectric effect (qualitative) – matter waves – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – scanning tunneling microscope.

UNIT V CRYSTAL PHYSICS 9

Crystalline and amorphous materials – unit cell, crystal systems, Bravais lattices, Crystal planes, directions and Miller indices – Characteristics of crystal structures: SC, BCC, FCC and HCP structures - crystal imperfections: point, line and surface defects – crystal growth : epitaxial and lithography techniques

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Recall the basics of properties of matter, thermal physics and ultrasonics, to improve their engineering knowledge.

CO2: Define the advanced physics concepts of quantum theory and the characteristics of crystalline materials.

CO3: Illustrate Bending of beams, thermal behavior and ultrasonic devices to assess societal and safety issues.

CO4: Summarize the dual aspects of matter, crystal structures and imperfections of crystals.

CO5: Apply the moduli of elasticity of different materials, thermal energy, ultrasonics, scanning tunneling microscope and crystal growth techniques in engineering fields.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam.T., Engineering Physics, Oxford University Press, 2015.
2. Gaur, R.K & Gupta.S.L, Engineering Physics, Dhanpat Rai Publishers, 2016.

3. Pandey.B.K, & Chaturvedi.S, Engineering Physics, Cengage Learning India. 2012.
4. Shatendra Sharma & Jyotsna Sharma, Engineering Physics, Pearson India Pvt Ltd., 2018

REFERENCES:

1. Halliday.D, Resnick, R. & Walker. J, "Principles of Physics", Wiley, 2015.
2. Malik H K & Singh A K, "Engineering Physics", McGraw Hill Education (India Pvt. Ltd.) 2nd edition 2018.
3. Serway.R.A. & Jewett, J.W, "Physics for Scientists and Engineers", Cengage Learning India. 2010.
4. Tiper.P.A. & Mosca.G, Physics for Scientists and Engineers with Modern Physics.

Course outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	1	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	1	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	2	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO	2	1	-	-	-	-	-	-	-	-	-	1	2	2	-

CH22101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To make the students conversant with water treatment methods and electrochemistry concept
- To gain basic knowledge of corrosion and protection methods
- To understand the basic concepts and synthesis of various engineering materials, nano materials and fuels
- To familiarise the students with the principles, working process and application of energy storage devices

UNIT I WATER TREATMENT **9**

Water: Sources, impurities - Hardness of water: Types - Estimation of hardness (EDTA method) - Disadvantages of hard water in boilers (Scale, Sludge) – Softening methods: Internal treatment

(Calgon, Sodium Aluminate) and External treatment (Demineralisation process). Domestic water treatment – Desalination of brackish water: RO and Solar desalination method.

UNIT II ELECTROCHEMISTRY AND CORROSION 12

Electrochemical cell – Free energy and emf – Nernst equation and applications – Oxidation and reduction potential – Standard electrodes: Standard Hydrogen electrode, Saturated calomel electrode, Glass electrode – pH measurement – Conductometric titration (acid-base, precipitation) and Potentiometric titrations: Redox titration (Fe^{2+} x $Cr_2O_7^{2-}$).

Corrosion – Types: Chemical corrosion and Electrochemical corrosion – Corrosion control methods: Sacrificial anodic and Impressed current Cathodic protection method

UNIT III FUELS AND COMBUSTION 8

Fuels - classification of fuels – Comparison of solid, liquid and gaseous fuel - Solid fuel - coal - analysis of coal (proximate only) – Liquid fuel - Petroleum – Refining of petroleum - manufacture of synthetic petrol (Bergius process) – Biodiesel – preparation, properties and uses. Gaseous fuel – CNG, LPG.

Combustion – Calorific value – Types (Gross and Net calorific value) – Dulong's formula – GCV and LCV calculation using Dulong's formula. Flue gas – Analysis of flue gas by Orsat method.

UNIT IV ENERGY STORAGE DEVICES 8

Batteries – Types (Primary and Secondary) - Lead acid battery, Lithium ion battery - Super capacitors – Storage principle, types and examples – Electric vehicle – working principle - Fuel cells – microbial fuel cell and polymer membrane fuel cell.

Nanomaterials in energy storage – CNT –Types, properties and applications.

UNIT V ENGINEERING MATERIALS 8

Abrasives – Types: Natural and Artificial – SiC – preparation, properties and uses. Refractories – Types Acidic, Basic, Neutral – Refractoriness, RUL. Cement – Manufacture – Special cement – white cement and water proof cement. Glass – Manufacture, properties and uses

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Recall the basic concepts of water softening, nano materials and batteries

CO2: Summarize the types of corrosion, fuels and energy storage devices

CO3: Explain the basic principles of electrochemistry and engineering materials

CO4: Identify suitable methods for water treatment, fuel and corrosion control

CO5: Apply the knowledge of engineering materials, fuels and energy storage devices for material selection and also in energy sectors

TEXT BOOKS:

5. P. C. Jain and Monika Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015.

6. S. S. Dara and S. S. Umare, “A Textbook of Engineering Chemistry”, S. Chand & Company LTD, New Delhi, 2015.
7. Sivasankar B. ‘’Engineering chemistry’’, Tata McGraw Hill Publishing company Ltd, New Delhi, 2008.

REFERENCES:

5. Friedrich Emich, “Engineering Chemistry”, Scientific International PVT, LTD, New Delhi, 2014.
6. Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi 2015.
7. B.S.Murty, P.Shankar, Baldev Raj, B B Rath and James Murday, ‘’ Text book of nano science and technology’’ Universities press.

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	0	1
CO2	3	2	2	1	-	-	-	-	-	-	-	1	-	1	0
CO3	3	2	2	1	-	-	1	-	-	-	-	1	-	2	0
CO4	3	2	2	1	-	-	2	-	-	-	-	1	-	1	2
CO5	3	2	2	1	-	-	2	-	-	-	-	1	-	1	0
CO	3	2	2	1	-	-	2	-	-	-	-	1	-	1	1

		L	T	P	C
CS22101	**PROBLEM SOLVING AND PYTHON PROGRAMMING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To understand the basics of algorithmic problem solving
- To learn to solve problems using Python conditionals and loops
- To define Python functions and use function calls to solve problems
- To use Python data structures - lists, tuples, and dictionaries to represent complex data
- To do input/output with files in Python

UNIT I **INTRODUCTION TO COMPUTERS AND PROBLEM SOLVING STRATEGIES** **9**

Introduction- Components and functions of a computer system- Hardware and Software. Problem solving strategies- Program design tools: Algorithms, Flow charts, Pseudo code

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS AND CONTROL FLOW 10

Features of Python -Variables and Identifiers – Data types: Numbers, Strings, Boolean, Tuples, List, Dictionary, Sets - Input operation - Comments, Reserved words, Indentation - Operators and Expressions – Type Conversion - Selection / Conditional Branching Statements - Basic Loop Structures / Iterative Statements - Nested Loops – break statement – continue statement – pass statement

UNIT III FUNCTIONS AND STRINGS 9

Functions: Function Definition, function call- variable scope and lifetime – return statements. Strings: Definition, operations (concatenation, appending, multiply, slicing) - immutability, comparison, iterations, string methods

UNIT IV LIST, TUPLES AND DICTIONARIES 9

Lists: Access, updating values- nested, cloning- list operations- list methods- looping in list. Tuples: Tuple operations- nested tuple; Dictionaries- Creating, Accessing, adding, modifying, deleting items

UNIT V FILES, EXCEPTIONS AND PACKAGES 8

Files: Types of files, Opening and closing Files, Reading and writing files, File positions, Renaming and deleting files. Exceptions: Errors and exceptions, Handling exceptions, Packages

TOTAL : 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to

CO1. Describe the algorithmic solutions to simple and complex computational problems
CO2. Apply functions, modules and packages in Python program and use conditionals and loops for solving problems
CO3. Analyze conditional branching statements
CO4. Evaluate python programs
CO5. Develop programs using compound data types and files

TEXT BOOKS

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, 13th Edition, Oxford University Press, 2022.

REFERENCES

1. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.

2. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
3. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
4. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
5. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021.
6. Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
7. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.
8. https://www.python.org/

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
CO	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-

HS22101 HIGHER ORDER THINKING L T P C
1 0 0 1

COURSE OBJECTIVES:

- Teaching the students the sources and dynamics of thinking.
- Teaching the students the basics of systematic and scientific thinking.
- Initiating the students into critical thinking and to use critical thinking in practical life
- Initiating students into creative thinking

UNIT I INTRODUCTION TO COGNITION, KNOWLEDGE AND THINKING 3

Cognition - Different Cognitive functions - Cognition and intelligence - Cognitive development: till adolescence and post adolescence - possibility of true knowledge - The sources of Knowledge. Sensation, perception. Reality of perception - Concept formation, abstraction. Memory and retrieving - Introduction to thinking and types of thinking. Systematic thinking

UNIT II LOGIC AND REASONING 3

Commonsense and scientific knowledge. Pursuit of truth.- Syllogistic Logic. Greek and Indian. - Exercises

UNIT III CRITICAL THINKING SKILLS AND DISPOSITIONS 3

Critical Thinking Skills & Dispositions. Critical Thinking Exercises

UNIT IV ANALYSIS OF ARGUMENTS 3

Propositions and fallacies. - Analyzing arguments. - Exercises.

UNIT V CREATIVE THINKING AND INNOVATIVE THINKING 3

Evolution of Scientific Thinking and Paradigm Shift. - Dynamics of Thoughts: Hegel. - Convergent thinking and divergent thinking (out of the box thinking). - Problem solving and Planning.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Demonstrate the sources of knowledge and the process of thinking
CO2: Demonstrate critical thinking skills and dispositions of critical thinking
CO3: Confidently engage in creative thinking and problem solving

REFERENCES:

1 Introduction to Logic, Irving M. Copi, Carl Cohen and Kenneth McMahon, Fourteenth Edition, Pearson Education Limited, 2014.
2 Teaching Thinking Skills: Theory and Practice, Joan Boykoff Baron and Robert J. Sternberg, W.H. freeman and Company, New York.
3 Cognitive Psychology, Robert J. Sternberg, Third Edition, Thomson Wadsworth, UK

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	2	1	-	-	1	-	1	-	1	1	-	-	-
CO	3	2	2	1	-	-	2	-	2	-	1	1	-	-	-

HS22102 UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
- To create an awareness on Engineering Ethics and Human Values.

- To understand social responsibility of an engineer.

UNIT I INTRODUCTION TO VALUE EDUCATION 6

Value Education - Definition, Concept and Need for Value Education, Basic Guidelines - The Content and Process of Value Education - Basic Guidelines for Value Education - Self exploration as a means of Value Education - Happiness and Prosperity as parts of Value Education.

UNIT II HARMONY IN THE HUMAN BEING 6

Human Being is more than just the Body- Harmony of the Self ('I') with the Body - Understanding Myself as Co-existence of the Self and the Body - Understanding Needs of the Self and the needs of the Body - Understanding the activities in the Self and the activities in the Body.

UNIT III HARMONY IN THE FAMILY, SOCIETY AND HARMONY IN THE NATURE 6

Family as a basic unit of Human Interaction and Values in Relationships - The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love - Comprehensive Human Goal: The Five Dimensions of Human Endeavour - Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

UNIT IV SOCIAL ETHICS 6

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.

UNIT V PROFESSIONAL ETHICS 6

Universal Human Values - Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies - Production System and Management Models.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Illustrate the significance of value inputs in a classroom and start applying them in their life and profession.

CO2: Explain the role of a human being in ensuring harmony in society and nature.

CO3: Demonstrate the value of harmonious relationship based on trust and respect in their life and profession.

CO4: Compare values, skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.

CO5: Classify ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

TEXT BOOKS:

1 R R Gaur, R Sangal, G P Bagaria, "Human Values and Professional Ethics", Excel Books, New Delhi, 2010.

2 A.N. Tripathy, "Human Values", New Age International Publishers, New Delhi, 2004.

REFERENCES:

1. Gaur. R.R., Sangal. R, Bagaria. G.P, "A Foundation Course in Value Education", Excel Books, 2009.
2. Gaur. R.R., Sangal. R, Bagaria. G.P, "Teachers Manual" Excel Books, 2009.
3. Gaur R R, R Sangal, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2009.
4. William Lilly, "Introduction to Ethic" Allied Publisher.

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-
CO2	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-
CO3	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-
CO4	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-
CO5	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-
CO	1	-	-	-	-	2	2	3	1	1	-	1	-	-	-

CS22102 PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES

- To understand the problem solving approaches
- To learn the basic programming constructs in Python
- To practice various computing strategies for Python-based solutions to real world problems
- To use Python data structures - lists, tuples, dictionaries
- To do input/output with files in Python

LIST OF EXPERIMENTS

1. Identification and solving of simple real life or scientific or technical problems, and developing algorithms and flow charts for the same
2. Python programming using simple statements and expressions
3. Scientific problems using Conditionals and Iterative loops
4. Implementing real-time/technical applications using Lists, Tuples
5. Implementing real-time/technical applications using Sets, Dictionaries
6. Implementing programs using Functions

7. Implementing programs using Strings
8. Implementing real-time/technical applications using File handling
9. Implementing real-time/technical applications using Exception handling
10. Exploring Pygame tool
11. Developing a game activity using Pygame like bouncing ball

TOTAL PERIODS: 60

COURSE OUTCOMES

Upon completion of the course, the students will be able to

CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs
CO3: Implement programs in Python using conditionals, loops and functions for solving problems
CO4: Process compound data using Python data structures
CO5**:** Utilize Python packages in developing software applications

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	2	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	1	3	-	-
CO	3	3	3	3	2	-	-	-	-	-	-	1	3	-	-

BS22101 PHYSICS – CHEMISTRY LABORATORY

L	T	P	C
0	0	4	2

PHYSICS LABORATORY

OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS

1. Non-uniform bending – Determination of Young's modulus.
2. SHM of Cantilever – Determination of Young's modulus.
3. Poiseuille's flow – Coefficient of viscosity of liquid
4. Torsional pendulum - Determination of Rigidity modulus.
5. Newton's ring – Radius of curvature of convex lens.
6. Lee's Disc – Determination of coefficient of thermal conductivity of bad conductor.

TOTAL: 30 PERIODS

CHEMISTRY LABORATORY

OBJECTIVES

- To inculcate experimental skills to test basic understanding of water quality parameters such as, acidity, alkalinity and hardness.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

LIST OF EXPERIMENTS

1. Determination of total hardness of water by EDTA method.
2. Conductometric titration of strong acid and strong base.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4.
5. Determination of alkalinity in water sample.
6. Estimation of iron content of the given solution using potentiometer.

TOTAL: 30 PERIODS

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Determine different moduli of elasticity used in day to day engineering applications.

CO2: Estimate the optical parameters of visible and laser sources along with their applications in various fields.

CO3: Interpret the band gap of semiconductor materials and also compressibility and viscosity of liquids.

CO4: Determine the water quality parameters of the given water sample.

CO5: Analyze quantitatively the metals (Fe, Ni,) in the any sample volumetrically as well as by using spectroanalytical methods.

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3

CO1	3	1	-	-	-	-	-	-	2	1	-	1	-	-	-
CO2	3	1	-	-	-	-	-	-	2	1	-	1	-	-	-
CO3	3	1	-	-	-	-	-	-	2	1	-	1	-	-	-
CO4	3	1	-	-	-	2	2	-	1	-	-	-	-	-	-
CO5	3	1	-	-	-	2	2	-	1	-	-	-	-	-	-
CO	3	1	-	-	-	2	2	-	2	1	-	1	-	-	-

SEMESTER II

EN22201	TECHNICAL ENGLISH	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To widen strategies and skills to augment ability to read and comprehend engineering and technology texts.
- To develop writing skill to make technical presentations.
- To draft convincing job applications and effective reports..
- To strengthen listening skills to comprehend technical lectures and talks in their areas of specialization.
- To cultivate speaking skills both technical and general.

UNIT I LANGUAGE STUDY **12**

Technical Vocabulary- synonyms, antonyms, prefix and suffix, word formation, Homonyms and Homophones - puzzles,- Reading: skimming a reading passage – scanning for specific information- Instruction- Interpreting – Writing: Recommendation- Checklist.

UNIT II READING AND STUDY SKILLS **6**

Active and Passive voice- Extended Definitions- Imperatives- Numerical Adjectives- Purpose Statement – Reading: Critical reading- Newspaper articles- journal reports- editorials and opinion blogs - Report Writing: Fire Accident, Industrial visit, Project report, feasibility report, survey report, business report.

UNIT III WRITING SKILLS- INTRODUCTION TO PROFESSIONAL WRITING **6**

Error Spotting/Common Errors- Concord-Compound words- Abbreviations and Acronyms- Discourse Markers - Finding key information – shifting facts from opinion- interpreting visual material- making inference from the reading passage - Interpretation of charts- - Minutes of the meeting- Paraphrasing- Proposal writing.

UNIT IV TECHNICAL WRITING AND GRAMMAR **6**

If Conditional Clauses- Prepositional Phrases- Fixed and semi fixed expressions- -e-mail communication- reading the attachment files having a poem /joke / proverb/sending their responses through e-mail.- Job application letter and Resume/CV/ Bio-data.

UNIT V EXTENDED WRITING AND LANGUAGE STUDY **6**

Articles- Cause and Effect expressions- Collocations- Sequencing words- Reading longer technical texts and taking down notes- Structure of Essay- Types of Essay: Narrative essay- Descriptive Essay- Analytical Essay- Cause and Effect Essay – Compare and contrast essays.

TOTAL – 30 PERIODS

PRACTICAL EXERCISES

Listening Skills – Listening for professional Development

Listening to UPSC Toppers Mock Interviews- Listening to debates/discussions/different viewpoints /scientific lectures/event narrations/documentaries/telephonic conversations

Speaking Skills –emphasizing communicative establishment

Seeking Information -asking and giving directions- narrating personal experiences/ events- answering interview questions- picture description- presenting a product and giving instruction to use a product – mini presentations-role plays- speaking in formal and informal situations- speaking about one's locations - speaking about great personalities –describing a simple process- telephone skills and etiquette

TOTAL: 30 PERIODS

TOTAL (T+P) = 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Infer advanced technical texts from varied technical genres to expand engineering knowledge and explore more ideas.

CO2: Analyze technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.

CO3: Present reports and job letters utilizing the required format prescribed on par with international standards using the exact vocabulary to make their works worthy to be read .

CO4: Employ the language tones and styles appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world

CO5: Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.

TEXT BOOKS:

1. Mike Markrl, " Technical Communication", Palgrave Macmillan, London, 2012.
2. Sumant,S and Joyce Pereira, "Technical English II", Chennai: Vijay Nicole Imprints Private Limited, 2014.
3. Kumar, Sanjay and Pushp Lata, "Communication Skills: A Workbook", New Delhi: OUP, 2018.

REFERENCES:

1. Raman, Meenakshi & Sangeetha Sharma, "Communication Skills", New Delhi: OUP, 2018.
2. Rizvi M, Ashraf, " Effective Technical Communication", New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007.

Course outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-

MA22201 **STATISTICS AND NUMERICAL METHODS** **L T P C**

3 1 0 4

COURSE OBJECTIVES:

- To provide the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To 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.
- To acquaint the knowledge of various numerical methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS **12**

Statistical hypothesis -Type I and Type II errors - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t distribution for single mean and equality of means - Test based on F distribution for equality of variances - Chi square test for single variance and goodness of fit - Independence of attributes - Contingency table :

Analysis of r × c tables.

UNIT II DESIGN OF EXPERIMENTS 12

General principles – Analysis of variance (ANOVA) - One way classification - Completely randomized design (CRD) – Two way classification - Randomized block design (RBD) – Three way classification -Latin square design(LSD) – Two factor experiments: 2^2 factorial design

UNIT III NUMERICAL SOLUTION OF EQUATIONS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel .

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Newton's forward and backward interpolation – Interpolation with unequal intervals - Lagrange's interpolation- Divided differences - Newton's divided difference - Approximation of derivates using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3, 3/8 rules- Numerical double integration: Trapezoidal and Simpson's rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods : Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods : Milne's and Adams - Bash forth predictor corrector methods for solving first order equations.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Define the basic concepts of statistical tests, ANOVA, iterative methods, interpolations and ODE.

CO2: Discuss the techniques of statistical tests and design of experiments.

CO3: Explain the solution of equations, ODE, single and multistep methods, interpolations, differentiation and integration.

CO4: Apply the concept of testing of hypothesis and design of experiment in real life.

CO5: Apply numerical techniques in system of equations, differential equations, interpolation, differentiation and integration.

TEXT BOOKS:

1. Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2006.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics, 4th Edition, Tata McGraw Hill Edition, 2012.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2012.

Course outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	2	-
CO	3	2	-	-	-	-	-	-	-	-	-	1	-	2	-

PH22203 **MATERIAL SCIENCE** **L T P C**

2 0 2 3

COURSE OBJECTIVES:

- To understand the concepts of light, electron transport properties and the essential principles of semiconductors.
- To become proficient in magnetic properties of materials
- To know the basics of the functioning of advanced engineering materials
- To induce the students to design new structures that serve humanity by applying the

knowledge gained during the course.

UNIT I PHOTONICS **6**

Interference – Air wedge – LASER – population inversion - Einstein coefficient's –NdYAG Laser - CO2 laser – semiconductor laser – Optical fibre – Total internal reflection – propagation of light – Numerical Aperture and Acceptance angle – Fiber optic communication system – Endoscopy.

UNIT II ELECTRICAL PROPERTIES OF MATERIALS **6**

Classical free electron theory - Expression for electrical conductivity and Thermal conductivity, Wiedemann-Franz law – Success and failures - Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Band theory of solids - Electron effective mass – concept of hole.

UNIT III SEMICONDUCTING MATERIALS **6**

Semiconductors –direct and indirect band gap semiconductors – Intrinsic semiconductors Carrier concentration, band gap in intrinsic semiconductors – extrinsic semiconductors - N-type & P-type semiconductors – Variation of carrier concentration and Fermi level with temperature - Hall effect - measurement of Hall coefficient - applications

UNIT IV MAGNETIC PROPERTIES OF MATERIALS **6**

Magnetic dipole moment – atomic magnetic moment, permeability, susceptibility- Magnetic material classification: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism – Domain Theory- B-H curve – Hard and soft magnetic materials – Magnetic storage devices: Magnetic hard disc with GMR sensor.

UNIT V ADVANCED ENGINEERING MATERIALS **6**

Composites - definition and classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Properties – Nanomaterials – mechanical properties – industrial applications.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Recall the basic concepts of light, electron transport properties of conductors and basic principles of semiconductors

CO2: Define the magnetic parameters and the principles of advanced engineering materials

CO3: Illustrate laser and fibre optics, classical and quantum concepts of conducting materials, physics of semiconducting materials.

CO4: Summarize the theories of magnetic materials and functioning of magnetic devices

CO5: Develop the applications of fibre optics, moduli of elasticity and thermal energy, behavior of conductors, semiconductors, magnetic and advanced engineering materials

in various engineering fields.

TEXT BOOKS:

1. Gaur, R.K & Gupta.S.L, Engineering Physics, Dhanpat Rai Publishers, 2016.
2. Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
3. Kasap,S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2017.
4. Kittel, C. Introduction to Solid State Physics. Wiley, 2017.

REFERENCES:

1. Raghavan, V. ―Materials Science and Engineering – A first course. PHI Learning, 2015.
2. Balasubramaniam, R. ―Callister's Materials Science and Engineering‖. Wiley India Pvt. Ltd., 2014.
3. Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems, CRC Press, 2014.

LIST OF EXPERIMENTS

1 Uniform bending – Determination of Young's modulus

2 Air-wedge – Thickness of thin wire

3 Spectrometer – Grating

4 LASER – Wavelength and particle size determination

5 Optical fibre – Acceptance angle and Numerical aperture

6 Band gap determination

TOTAL:30 PERIODS

TOTAL (T+P) = 60 PERIODS

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	1	-	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	2	-

CO5	3	3	-	-	-	-	-	-	2	1	-	1	-	1	-
CO	2	1	-	-	-	-	-	-	2	1	-	1	-	2	-

ES22202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the basic circuit components.
- To educate on the working principles and applications of electrical machines.
- To explain the construction and working of semiconductor devices
- To educate on logic gates, flip flops and registers
- To introduce the functional elements and working of measuring instruments.

UNIT I INTRODUCTION TO ELECTRICAL ENGINEERNG **9**

Introduction-Conductors, semiconductors and Insulators-Electrostatics – Electric Current-Electromotive Force-Electric Power- Ohm's Law-Basic circuit components-Electromagnetism related laws-Kirchhoff's Laws.

UNIT II ELECTRICAL MACHINES **9**

Construction, working principle and types of DC Generator – Motor- single phase Transformer - single phase and three phase Induction motor -Applications

UNIT III ANALOG ELECTRONICS **9**

Classification of Semiconductors– Construction , Characteristics and working -PN Junction Diode- Zener Diode - Bipolar Junction Transistor-IGBT- SCR- MOSFET.

UNIT IV DIGITAL ELECTRONICS **9**

Review of number systems, binary codes- Boolean Algebra-Logic gates-Implementation of Boolean expression using K-map –Types of flip flops, Registers.

UNIT V MEASUREMENTS AND INSTRUMENTATION **9**

Functional elements of an instrument –Static and dynamic characteristics of instruments, Errors, Principles of electrical indicating instruments- Types of indicating instruments -Moving Coil and Moving Iron instruments- DSO -Transducers-Resistive Transducers

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Apply the basic laws to determine circuit parameters

CO2: Explain the construction, working and application of electrical machines.

CO3: Explain the construction and working of semiconductor devices.

CO4: Interpret the function of combinational and sequential circuits.

CO5: Interpret the operating principles of measuring instruments.

TEXT BOOKS:

1. M .S.Sukhja ,T.K.Nagsarkar "Basic Electrical and Electronics Engineering" Oxford Higher Education First Edition ,2018.
2. S. Salivahanan, R.Rengaraj "Basic Electrical and Instrumentation Engineering" McGraw Hill Education ,First Edition,2019.

REFERENCES:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Elecronics Engineering", Fourth Edition, McGraw Hill Education, 2019.
2. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.
3. V. K. Mehta, Rohit Mehta "Basic Electrical Engineering", S.Chand & Company Pvt. Ltd, New Delhi, 2012.

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	1	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	1	-	-
CO	3	2	2	2	-	-	-	-	-	-	-	1	1	-	-

CH22201	ENVIRONMENT AND SUSTAINABILITY	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the concept of ecosystem and biodiversity.
- To conversant with various types of pollution and its effects.
- To obtain knowledge on natural resources and its exploitation.
- To understand the social issues related to environment and methods to protect.
- To gain knowledge on sustainability and environment.

UNIT I ECOSYSTEM AND BIODIVERSITY **6**

Environment – Ecosytem – Structure and function of an ecosystem – Energy flow in an ecosystem – Food chain and food web –.Biodiversity – Types – Values, threats and conservation of biodiversity – Endangered and endemic species – Hot spot of biodiversity – Biodiversity at state level, national level and global level.

UNIT II NATURAL RESOURCES **6**

Introduction – Forest resources – Uses and Overexploitation - Deforestation – causes and consequences – Water resources – effect of over utilisation of water – Food resources – Impacts of modern agriculture (pesticides, fertilizers, water logging, salinity) – Sustainable Energy resources – Wind, Solar, hydroelectric power, geothermal – Land resources – Desertification, soil erosion – Role of an individual in the conservation of natural resources.
Case study – Deforestation, water conflicts, fertilizer and pesticide problem.

UNIT III ENVIRONMENTAL POLLUTION AND MANAGEMENT **7**

Definition, causes, effects and control measures of air pollution, water pollution, noise pollution, thermal pollution and marine pollution – Waste water treatment - Waste management – solid waste, bio waste, e-waste - Disaster management – Flood, cyclone, earthquake

UNIT IV SOCIAL ISSUES AND HUMAN HEALTH **6**

Population explosion and its effects on environment — variation of population among nations - Environmental issues and Human health – Food adulteration – Risk of food adulteration – Detection and prevention of food adulteration - COVID-19 – Human rights – Value education

UNIT V SUSTAINABLE DEVELOPMENT AND ENVIRONMENT **5**

Sustainable development – needs and challenges — Goals – Aspects of sustainable development – Assessment of sustainability - Environmental ethics – Green chemistry – Eco mark, Eco products – EIA – Regional and local environmental issues and possible solutions - Role of engineering in environment and human health

TOTAL: 30PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Recall the basic concepts of environment and sustainable development.

CO2: Summarize the types of pollution, various natural resources and food adulterants.

CO3: Explain the methods for waste management and detection of adulterants.

CO4: Apply the gained knowledge to overcome various issues related to health and environment.

CO5: Identify suitable methods for local environmental issues and sustainability.

TEXT BOOKS:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, New Delhi, 2017.
2. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2ndEdition, Pearson Education, 2015.

REFERENCES:

1. Erach Bharucha, "Text book of Environmental studies" Universities Press (I) PVT LTD, Hyderabad, 2015.
2. Rajagopalan. R, "Environmental Studies - From Crisis to Cure", Oxford University Press, 2015.
3. G. Tyler Miller and Scott E. Spoolman, —"Environmental Science", Cengage Learning India PVT LTD, 2014.

EXPERIMENTS

1. Determination of DO content of waste water sample (Winkler's method).
2. Determination of chloride content of water sample by Argentometric method
3. Estimation of copper content in water by Iodometry.
4. Determination of Ca / Mg in waste water sample
5. Detection of adulterant in ghee/edible oil/coconut oil.
6. Detection of adulterant in sugar/honey/chilli powder.

TOTAL:30 PERIODS

TOTAL (T+P) = 60 PERIODS

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	3	-	1	1	-	1	-	-	2
CO2	3	-	-	-	-	-	3	-	1	1	-	1	-	-	1
CO3	3	-	-	-	-	-	3	-	1	1	-	1	-	-	2

CO4	3	-	-	-	-	-	3	-	1	1	-	1	-	-	2
CO5	3	-	-	-	-	-	3	-	1	1	-	1	-	-	2
CO	3	-	-	-	-	-	3	-	1	1	-	1	-	-	2

ME22201 ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

Course Objectives

1 To draw the engineering curves.

2 To draw orthographic projection of points and lines

3 To draw orthographic projection of solids and section of solids.

4 To draw the development of surfaces

5 To draw the isometric projections of simple solids and freehand sketch of simple objects.

CONCEPTS AND CONVENTIONS

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT – I PLANE CURVES 12

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT – II PROJECTION OF POINTS, LINES AND PLANES 12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. 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 and traces

Projection of planes (polygonal and circular surfaces) inclined to any one principal plane.

UNIT – III PROJECTION OF SOLIDS 12

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to any one of the principal planes by rotating object method.

UNIT – IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12

Sectioning of solids (Prisms, pyramids cylinders and cones) 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 PROJECTIONS AND FREEHAND SKETCHING 12

Principles of isometric projection — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids & cylinders, in simple vertical positions.

Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.

Practicing three dimensional modeling of projection of simple objects by CAD Software (Demonstration purpose only).

Total 60

OUTCOMES: At the end of the course the students would be able to

CO1	Recall the existing national standards and interpret a given three dimensional drawing .
CO2	Interpret graphics as the basic communication and methodology of the design process
CO3	Acquire visualization skills through the concept of projection
CO4	Develop the sectioned solids and discover its true shape
CO5	Develop imagination of physical objects to be represented on paper for engineering communication.

Textbooks:

1. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
2. Jeyapoovan T., “Engineering Graphics using AutoCAD”, Vikas Publishing House, 7th Edition, 2015.

References:

1. Venugopal K. and Prabhu Raja V., “Engineering Graphics", New Age International (P) Limited, 2008.
2. Julyes Jai Singh S., “Engineering Graphics”, SRM tri sea publishers, Nagercoil,7th Edition,2015.
3. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.
4. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
5. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-

CO2	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO4	3	1	-	-	-	-	-	-	-	2	-	-	1	-	-
CO5	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-
CO	3	1	-	-	-	-	-	-	-	2	-	-	1	2	-

ME22202 ENGINEERING MECHANICS

L	T	P	C
2	1	0	3

Course Objectives

1. To Learn the use scalar and vector analytical techniques for analyzing forces in statically
2. To determine the structures of the beams and columns.
3. To introduce the equilibrium of rigid bodies
4. To study and understand the distributed forces, surface, loading on beam and intensity.
5. To understand the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.

UNIT – I STATICS OF PARTICLES **9**

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles , - Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in a Plane, Lami's theorem, Parallelogram law of forces, triangular law, Rectangular Components of a Force, Resultant of Forces, Resolution of a coplanar Forces.

UNIT – II EQUILIBRIUM OF RIGID BODIES **9**

Principle of Transmissibility, Equivalent Forces, Equilibrium of a Particles in two dimension, Forces in Space, Varignon's theorem, Equilibrium of a Particle in Space. Types of beams, Distributed Loads on Beams, type of supports and reaction.

UNIT – III DISTRIBUTED FORCES **9**

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Theorems of Pappus-Guldinus, Centre of Gravity of a Three Dimensional Body, Centroid of a Volume, Composite Bodies, Moments of Inertia of Areas and Mass, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem.

UNIT –IV FRICTION **9**

Frictional force, static, dynamic & limiting friction, normal reaction, angle of repose, coefficient of friction, laws of static friction, laws of dynamic friction, equilibrium of a body on a rough inclined plane-, Rolling Resistance, Ladder friction.

UNIT – V DYNAMICS OF PARTICLES 9

Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium- D'Alembert principle—Work- energy method, Principle of Impulse and Momentum, Collision of elastic bodies, coefficient of restitution -Newton's law of collision of elastic bodies, direct impact of elastic bodies.

Total 45

OUTCOMES: At the end of the course the students would be able to

CO1. Illustrate the vectorial and scalar representation of forces and moments.

CO2. Analyse the rigid body in equilibrium.

CO3. Evaluate the properties of distributed forces.

CO4. Determine the friction and the effects by the laws of friction.

CO5. Calculate dynamic forces exerted in rigid body.

Textbooks:

1 K.V. Natarajan, "Engineering mechanics", Dhanalakshmi publications, 33th edition, 2019.

2 Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

References:

1 Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11thEdition, 2017.

2 Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.

3 Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.

4 Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.

5 Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.

6 Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics,

5thEdition, McGraw Hill Higher Education, 2013.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	1	-	2	-	2	-
CO2	3	3	-	-	-	-	-	-	-	1	-	2	-	2	-
CO3	3	3	2	2	-	-	-	-	-	1	-	2	-	2	-
CO4	3	3	2	2	-	-	-	-	-	1	-	1	-	3	-
CO5	3	3	2	2	-	-	-	-	-	1	-	2	-	2	-
CO	3	3	2	2	-	-	-	-	-	1	-	2	-	2	-

ME22203 **COMPUTER AIDED DESIGN AND DRAFTING LABORATORY**

L	T	P	C
0	0	4	2

Course Objectives

1 To learn the standard drawing practices using fits and tolerances.

2 To prepare assembly drawings both manually and using standard CAD packages.

3 To Preparing standard drawing layout for modeled parts.

4 To Preparing standard drawing layout for assemblies with BoM.

5 To acquaint the skills and practical experience in handling 2D drafting and 3D modelling software systems.

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 - Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of Geometric Dimensioning & Tolerancing, Introduction to SP46-2003.

PART - II 2D DRAFTING **48**

Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed Drawing.

1. Bearings – Bush Bearing,
2. Valves – Safety and Non-return Valves.
3. Couplings – Flange couplings.

4. Joints – Universal, Knuckle, Gib & Cotter, Sleeve & Cotter joints.
5. Engine parts – Piston, Connecting Rod, Crosshead (vertical and horizontal), Stuffing box,
6. Machine Components – Screw Jack, Machine Vice, Plummer Block.
7. Prepare the relevant views of the parts of a given assembly drawing needed for the purpose of production.

Total 60

OUTCOMES: At the end of the course the students would be able to

CO1. Apply standard drawing practices using fits and tolerances.

CO2. Sketch orthogonal views of machine components.

CO3. Sketch orthogonal views of assembled components.

CO4. Prepare standard drawing layout for assembled parts.

CO5. Prepare bill of materials for assembled drawing.

Textbooks:

1 P.S. Gill, "A Textbook of Machine Drawing", S.K. Kataria & Sons, 2013.

2 N. D. Bhatt and V.M. Panchal, "Machine Drawing", 45th Edition, Charator Publishers,2016

References:

1 Goutam Pohit and Goutam Ghosh, "Machine Drawing with AutoCAD", 1st Edition,Pearson Education, 2014

2 Junnarkar, N.D., "Machine Drawing", 1st Edition, Pearson Education, 2012

3 N. Siddeshwar, P. Kanniah, V.V.S. Sastri, "Machine Drawing" , published by Tata McGrawHill,2014

4 S. Trymbaka Murthy, "A Text Book of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 2013.

5 K.L. Narayana, "Production Drawing". New Age International Pvt Ltd; Third edition, 2014.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	1	1	-	1	2	-	-
CO2	1	-	-	-	2	-	-	-	1	1	-	1	2	-	-
CO3	1	-	-	-	2	-	-	-	1		-		2	-	-
CO4	1	-	-	-	2	-	-	-	1	1	-	1	2	-	-
CO5	1	-	-	-	2	-	-	-		1	-	1	2	-	-
CO	1	-	-	-	2	-	-	-	1	1	-	1	2	-	-

ES22203	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives: The main learning objective of this course is to prepare the students for

1	Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in commonhousehold wood work.
2	Wiring various electrical joints in common household electrical wire work.
3	Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work.
4	Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & MECHANICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:
- ❖ Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- ❖ Preparing plumbing line sketches.
- ❖ Laying pipe connection to the suction side of a pump
- ❖ Laying pipe connection to the delivery side of a pump.
- ❖ Connecting pipes of different materials: Metal, plastic and flexible pipes used inhousehold appliances.

WOOD WORK:
- ❖ Sawing,
- ❖ Planning and
- ❖ Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

PART II MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:
- ❖ Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- ❖ Practicing gas welding.

BASIC MACHINING WORK:
- ❖ Perform turning operation in the given work piece.
- ❖ Perform drilling operation in the given work piece.
- ❖ Performing tapping operation in the given work piece.

ASSEMBLY WORK
- ❖ Assembling a centrifugal pump.
- ❖ Assembling a household mixer.

SHEET METAL WORK:
- ❖ Making of a square tray

GROUP – B (ELECTRICAL AND ELECTRONICS)

PART-III ELECTRICAL ENGINEERING PRACTICES 15

- One lamp controlled by one switch.
- Series and parallel wiring.
- Staircase wiring.
- Fluorescent Lamp wiring.
- Residential wiring.
- Iron Box wiring and assembly.

PART-IV ELECTRONIC ENGINEERING PRACTICES 15

- Introduction to electronic components and equipment's
- Calculation of resistance using colour coding
- Verify the logic gates AND, OR, EX-OR and NOT.
- Measurement of AC signal parameters using CRO
- Soldering simple electronic circuits on a small PCB and checking continuity.

Total 60

COURSE OUTCOMES: At the end of the course the students would be able to

CO1 Prepare various pipe and furniture fittings used in common household.

CO2 Perform the given metal joining and metal removal operation in the given work piece as per the dimensions.

CO3 Apply the fundamental concepts involved in Electrical Engineering

CO4 Explain the basic electrical wiring procedures.

CO5 Assemble basic electronic components.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO2	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO3	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO4	2	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO5	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-
CO	3	-	-	-	-	-	-	-	3	1	-	1	-	1	-

SEMESTER III

MA22304	Transforms and Partial Differential Equations	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To familiarize the basic concepts of Laplace transform and inverse Laplace transform techniques used in wide variety of situations.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **12**

Degree and order of partial differential equations -First order linear partial differential equations - Lagrange's linear equation: Method of grouping and method of multipliers - Homogeneous linear partial differential equations of second and higher order with constant coefficients with functions $e^{ax+by}, \sin(ax+by), \cos(ax+by)$.

UNIT II FOURIER SERIES **12**

Conditions for a Fourier expansion: Dirichlet's conditions –Fourier series - Euler's Formulae– General Fourier series for functions of polynomials in the interval (0,2π) and (0,2l) - Functions having points of continuity and discontinuity - Half range series: Half range sine and cosine series (polynomials only) – Root mean square value.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **12**

Classification of PDE of second order – One-dimensional wave equation: Fourier series solutions of one-dimensional wave equation with zero initial velocity– Fourier series solutions of one-dimensional wave equation with zero initial displacement - One dimensional equation of heat conduction – Steady state conditions with zero boundary conditions.

UNIT IV LAPLACE TRANSFORM **12**

Definition of the Laplace Transform -Existence conditions – Transforms of elementary functions $t^n, e^{at}, e^{-at}, sinat, cosat, sinhat, coshat$ – Transform of unit step function and unit impulse function – Basic properties : Linear, Change of scale, First Shifting theorem (Statement only) –Problems based on properties- Differentiation of Transform:$L[t\,f(t)]$- Integration of Transform: $L\left[\frac{f(t)}{t}\right]$– Initial and final value theorems(Statement only)– Problems based on Initial and final value theorems - Laplace Transform of periodic functions.

UNIT V INVERSE LAPLACE TRANSFORM **12**

Inverse Laplace Transform– Inverse Laplace Transform of elementary functions – Basic properties: Linear, First Shifting theorem, Change of scale (Statement only) - Problems based on properties - Convolution theorem(Statement only) – Inverse Laplace Transform using Convolution theorem.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Solve the standard partial differential equations.

CO2: Find the Fourier series for periodic functions.

CO3: Apply Fourier series in one dimensional heat and wave equations.

CO4: Determine the Laplace transforms for functions.

CO5: Apply inverse Laplace transforms in engineering fields.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2018.
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

REFERENCES:

1. James. G., "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, New Delhi, 2016.
2. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
3. Srimanta Pal, Suboth C. Bhunia, " Engineering Mathematics", Oxford University Press, New Delhi, 2015,
4. R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics" 5th Edition, Narosa Publishing House Pvt.Ltd., New Delhi, 2016.
5. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-

ME22301	ENGINEERING THERMODYNAMICS	L	T	P	C
		3	1	0	4

Course Objectives

1 Impart knowledge on the basics and application of zeroth and first law of thermodynamics.

2 Impart knowledge on the second law of thermodynamics in analyzing the performance of thermal devices.

3 Impart the various properties of steam through steam tables and Mollier chart.

4 Impart knowledge on the macroscopic properties of ideal and real gases.

5 Be able to understand the basic terminology and definitions related to air properties

UNIT – I BASICS, ZEROTH AND FIRST LAW 12

Review of Basics – Thermodynamic systems, Properties and processes Thermodynamic Equilibrium - Displacement work - P-V diagram. Thermal equilibrium - Zeroth law – Concept of temperature and Temperature Scales. First law – application to closed and open systems – steady flow processes.

UNIT – II SECOND LAW AND ENTROPY 12

Heat Engine – Refrigerator - Heat pump. Statements of second law and their equivalence & corollaries. Carnot cycle - Reversed Carnot cycle - Performance - Clausius inequality. Concept of entropy - T-s diagram - Tds Equations - Entropy change for a pure substance. Principle of increase in entropy- simple problems.

UNIT – III PROPERTIES OF PURE SUBSTANCES 12

Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart.

UNIT – IV GAS MIXTURES AND THERMODYNAMIC RELATIONS 12

Properties of Ideal gas, real gas - comparison. Equations of state for ideal and real gases. vander Waal's relation - Principle of Corresponding states - Maxwell relations - TdS Equations - heat capacities relations - Joule-Thomson experiment - Clausius-Clapeyron equation.

UNIT – V PSYCHROMETRY 12

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 60

COURSE OUTCOMES: At the end of the course the students would be able to

1 List the fundamental concepts in Thermodynamics and classify the thermodynamic processes around them.

2 Apply Laws of Thermodynamics in practical situations when called for.

3 Apply mathematical fundamentals to analyse the properties of steam, gas and gas mixtures.

4 Apply various thermodynamic relations, tables and charts for problem solving.

5 Apply different psychometric process and adapt the same for computing the properties of air-vapour mixture.

Textbooks

1 Nag.P.K., "Engineering Thermodynamics", 6th Edition, Tata McGraw Hill (2017), New Delhi.

2 Cengel, Y and M. Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill,8th Edition, 2015.

References

1 Natarajan, E., "Engineering Thermodynamics: Fundamentals and Applications", 2nd Edition (2014), Anuragam Publications, Chennai

2 Chattopadhyay, P, "Engineering Thermodynamics", 2nd Edition Oxford University Press, 2016.

3 Rathakrishnan, E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice Hall of India Pvt. Ltd, 2006.

4 Claus Borgnakke and Richard E. Sonntag, "Fundamentals of Thermodynamics", 7th Edition, Wiley Eastern, 2009.

5 Venkatesh. A, "Basic Engineering Thermodynamics", Universities Press (India) Limited, 2007.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	-	-	-	-	-	-	-	1	1	2	-
CO2	3	3	3	-	-	-	-	-	-	-	-	1	1	2	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	1	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	1	1	2	-
CO5	3	3	3	-	-	-	-	-	-	-	-	1	2	3	-
CO	3	2	2	-	-	-	-	-	-	-	-	1	1	2	-

ME22302 FLUID MECHANICS AND MACHINERY

L	T	P	C
3	0	2	4

Course Objectives: The main learning objective of this course is to prepare the students for:

1 To introduce the students about properties of the fluids, behaviour of fluids under static conditions.

2	To impart basic knowledge of the dynamics of fluids
3	To expose to the applications of the conservation laws to flow measurements and flow through pipes (both laminar and turbulent)
4	To expose to principles of dimensional analysis and similitude to simple problems and use dimensionless parameters.
5	To expose the students to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.

UNIT – I FLUID STATICS **9**

Fluid statics: Physical properties of fluids- specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure –measurement of pressure. Manometers Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law.

UNIT – II FLUID KINEMATICS AND DYNAMICS **12**

Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, three dimensional flow.

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line.

Closed conduit flow: Darcy Weisbach equation- Minor losses in pipes

UNIT – III DIMENSIONAL ANALYSIS AND MODEL STUDIES **7**

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

UNIT – IV TURBINES **9**

Classification of turbines - Velocity triangles -– Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Specific speed - Performance curves for turbines - Governing of turbines.

UNIT – V PUMPS **8**

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Rotary pumps.

Practical: **30**

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Determination of friction factor for a given set of pipes.
4. Conducting performance test and drawing the characteristic curves of Gear pump/ reciprocating pump/ centrifugal pump/ submergible pump
5. Conducting performance test on Pelton wheel./ Francis turbine./ Kaplan turbine.

Total **75**

COURSE OUTCOMES: At the end of the course the students would be able to

CO1	Describe the properties and behaviour of fluid in static conditions.

CO2	Explain the conservation laws applicable to fluids and its application through fluid kinematics and dynamics
CO3	Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies
CO4	Explain the working principles of various turbines and design the various types of turbines
CO5	Explain the working principles of centrifugal, reciprocating and rotary pumps

Textbooks:

1. R. K. Bansal, Fluid Mechanics and Hydraulic Machines (10th edition), Laxmi Publications (P). ltd; New Delhi, 2019.
2. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014

References:

1. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2011.
2. Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 22nd edition (2019) .
3. Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016.
4. Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014.
5. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	-	-	-	-	1	1	-	1	-	2	-
CO2	3	3	3	-	-	-	-	-	2	1	-	1	-	2	-
CO3	3	3	2	-	-	-	-	-	1	1	-	2	-	2	-
CO4	3	3	3	-	-	-	-	-	2	1	-	1	-	1	-
CO5	3	3	3	-	-	-	-	-	2	1	-	1	-	2	-
CO	3	2	2	-	-	-	-	-	2	1	-	1	-	2	-

ME22303	MANUFACTURING PROCESS	L	T	P	C
		3	0	0	3

Course Objectives:

The main learning objective of this course is to prepare the students for:

1. To understand the working principles of various metal casting processes and metal joining processes
2. To learn the working principles of bulk deformation of metals. and sheet metal forming process.
3. To study and practice the working principles of plastics moulding.
4. To study various terminologies used in production technology.
5. To learn the basic concepts used in construction of various machine tools.

UNIT – I CASTING PROCESSES & PLASTIC MOLDING 9

Sand Casting – Sand Mould – Type of patterns - Molding sand Properties and testing – Cores –Types and applications –Defects in Sand casting process-remedies.

Molding of thermoplastics & Thermosetting polymers– working principles and typical applications – injection molding –Compression molding, Transfer Molding – Extrusion – Thermoforming – Bonding of Thermoplastics.

UNIT – II FORMING PROCESS 9

Hot working and cold working of metals – Forging processes –cold forging- Characteristics of the processes – Typical forging operations – rolling of metals – Types of Rolling – Flat strip rolling – shape rolling operations – Principle of rod and wire drawing – Tube drawing.

Sheet metal characteristics – Typical shearing, bending and drawing operations

UNIT – III 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.

UNIT – IV FUNDAMENTALS OF MACHINING AND MACHINING OPERATION 9

Mechanics of chip formation, single point cutting tool, Types of chip, cutting tools – nomenclature.

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments. Capstan and turret lathes.

UNIT – V MILLING, GRINDING & DRILLING MACHINES 9

Milling Machines: Classification, constructional features, milling cutters nomenclature, milling operations..

Grinding Machines: Types of abrasives, bonding process, grinding wheel types. Classification, constructional features of grinding machines (Centre-less, cylindrical and surface grinding).

Drilling Machine: Classification, constructional features, drilling & related operations.

Total 45

COURSE OUTCOMES: At the end of the course the students would be able to

CO1	Explain the principle of different metal casting processes.
CO2	Describe the various metal joining processes.
CO3	Outline the various sheet metal forming process.
CO4	Explain basic concepts used in construction of various machine tools.
CO5	Classify various mechanisms underlying the working of various machine tools.

Textbooks:

1. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2006
2. P.N.Rao Manufacturing Technology Volume 1&2 Mc Grawhill Education 2017

References:

1. Roy. A. Lindberg, Processes and materials of manufacture, PHI / Pearson education, 2006.
2. S. Gowri P. Hariharan, A.Suresh Babu, Manufacturing Technology I, Pearson Education, 2008.
3. Paul Degarma E, Black J.T and Ronald A. Kosher, Eligth Edition, Materials and Processes, in Manufacturing ,Eight Edition ,Prentice – Hall of India, 1997.
4. HajraChouldhary 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 Text book of production Technology, S.Chand and Co. Ltd., 2004

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	-	-	-	-	-	1	-	1	-	2	-
CO2	3	3	2	-	-	-	-	-	-	1	-	1	-	2	-
CO3	3	3	2	-	-	-	-	-	-	-	-	1	-	1	-
CO4	3	3	2	-	-	-	-	-	-	1	-	1	-	1	-
CO5	3	3	2	-	-	-	-	-	-	1	-	1	-	1	-
CO	3	2	2	-	-	-	-	-	-	1	-	1	-	2	-

EE22308 ELECTRICAL DRIVES AND CONTROL

L	T	P	C
3	0	2	4

Course Objectives

The main learning objective of this course is to prepare the students for:

1 To understand the basic concepts of different types of electrical machines and their performance

2 To study the drive motor characteristic

3 To study the different methods of starting D.C motors and induction motors

4 To study the conventional and solid-state DC drives

5 To study the conventional and solid-state AC drives

UNIT – I INTRODUCTION 9

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

UNIT – II DRIVE MOTOR CHARACTERISTICS 12

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

UNIT – III STARTING METHODS 7

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

UNIT – IV CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES 9

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications

UNIT – V CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES 8

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

Practical 30

List of Experiments:

1. Determination of performance characteristics by conducting oad test on DC Shunt & DC Series motor
2. Determination of performance characteristics by conducting Speed control test of three phase slip ring Induction Motor
3. Determination of performance characteristics by conducting Load test on a single phase induction motor
4. Speed control of DC shunt motor (Armature, Field control)

5. V curves and inverted V curves of synchronous Motor

6. Load test on three phase squirrel cage Induction motor

Total **75**

COURSE OUTCOMES: At the end of the course the students would be able to

1 Infer the basic concepts of electric drives and the factors influencing the electric drives.

2 Compare different electrical motors and its characteristics.

3 Demonstrate different starting methods for electrical motors.

4 Illustrate conventional and solid state speed control of DC drives.

5 Illustrate conventional and solid state speed control of AC drives.

Text Books:

1 Nagrath .I.J. & Kothari .D.P, "Electrical Machines", Tata McGraw-Hill, 2006 2.

2 Vedam Subrahmaniam, "Electric Drives (Concepts and Applications)", Tata McGraw-Hill, 2010

References:

1 Partab. H., "Art and Science and Utilisation of Electrical Energy", Dhanpat Rai and Sons, 2017

2 Pillai.S.K "A First Course on Electric Drives", Wiley Eastern Limited, 2012

3 Singh. M.D., K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, 2006.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1		-	-	-	-	-	1	1	-	1	-	2	-
CO2	3	1	2	-	-	-	-	-	2	2	-	1	-	2	-
CO3	2	1	1	-	-	-	-	-	2	1	-	1	-	1	-
CO4	1	2	2	-	-	-	-	-	2	1	-	1	-	2	-
CO5	1	2	2	-	-	-	-	-	2	1	-	1	-	2	-
CO	3	2	2	-	-	-	-	-	2	1	-	1	-	2	-

AC22301	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

Course Objectives

1 Teach history and philosophy of Indian Constitution.

2 Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.

3 Summarize powers and functions of Indian government.

4 Explain emergency rule.

5 Explain structure and functions of local administration.

UNIT – I INTRODUCTION **6**

History of Making of the Indian Constitution - Drafting Committee - Philosophy of the Indian Constitution – Preamble - Salient Features

UNIT – II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES **6**

Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Fundamental Duties

UNIT – III ORGANISATIONS OF GOVERNANCE **7**

Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - Executive President – Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges - Qualifications, Powers and Functions.

UNIT – IV EMERGENCY PROVISIONS **4**

Emergency Provisions - National Emergency, President Rule, Financial Emergency.

UNIT – V LOCAL ADMINISTRATION **7**

District's Administration head - Role and Importance –Municipalities - Introduction- Mayor and role of Elected Representative - CEO of Municipal Corporation -Pachayati raj – Introduction - PRI- Zila Pachayat- Elected officials and their roles.

Total **30**

OUTCOMES: At the end of the course the students would be able to

1 Able to understand history and philosophy of Indian Constitution.

2 Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

3 Able to understand powers and functions of Indian government.

4 Able to understand emergency rule.

5 Able to understand structure and functions of local administration.

Textbooks:

1. Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.
3. Jain M P, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. The Constitution of India (Bare Act), Government Publication,1950

References:

1. M.V.Pylee, "Introduction to the Constitution of India",4th Edition, Vikas publication,2005.
2. Durga Das Basu (DD Basu), "Introduction to the constitution of India", (Student Edition),19th Edition, Prentice-Hall EEE, 2008.
3. Merunandan, "Multiple Choice Questions on Constitution of India", 2nd Edition, Meraga publication, 2007.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	1	-	-	1	1	-	1	-	-	-	1	1	-	2
CO2	-	1	-	-	-	1	-	1	-	-	-	-	1	-	2
CO3	-	1	-	-	-	1	-	1	-	-	-	-	2	-	2
CO4	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2
CO5	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2
CO	-	1	-	-	1	1	-	1	-	-	-	1	1	-	2

HS22301 VALUE EDUCATION – I

L	T	P	C
1	0	0	0

Course Objectives

1 To give the students a deeper understanding about the purpose of life.

2 To animate the students to have a noble vision and a right value system for their life.

3 To help the students to set short term and long term goals in their life.

UNIT – I My Life and My Place in the Universe **4**

Value of my life – My Uniqueness, strengths and weakness – My self-esteem and confidence – My identity in the universe.

UNIT – II My Life and the Other **4**

Realising the need to relate with other persons and nature – My refined manners and conduct in relationships – Basic communication and relationship skills – Mature relationship attitudes.

UNIT – III My Life is My Responsibility **3**

Personal autonomy – developing a value system and moral reasoning skills – setting goals for life.

UNIT – IV Understanding My Education and Developing Maturity **4**

Importance of my Engineering education – Managing emotions - personal problem solving skills.

Total **15**

OUTCOMES: At the end of the course the students would be able to

1 Explain the importance of value based living.

2 Set realistic goals and start working towards them.

3 Apply the interpersonal skills in their personal and professional life.

4 Emerge as responsible citizens with a clear conviction to be a role model in the society.

References:

1. David Brooks. The Social Animal: The Hidden Sources of Love, Character, and Achievement. Random House, 2011.
2. Mani Jacob. Resource Book for Value Education. Institute of Value Education, 2002.
3. Eddie de Jong. Goal Setting for Success. CreateSpace Independent Publishing, 2014.
4. Dr.Abdul kalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12		2	3
CO1	-	-	-	-	-	2	-	1	1	2	-	2	-	-	-
CO2	-	-	-	-	-	2	-	1	1	2	-	2	-	-	-
CO3	-	-	-	-	-	2	-	1	1	2	-	2	-	-	-

CO4	-	-	-	-	-	2	-	1	1	2	-	2	-	-	-
CO	-	-	-	-	-	2	-	1	1	2	-	2	-	-	-

ME22304 MANUFACTURING PROCESS LABORATORY

L	T	P	C
0	0	4	2

Course Objectives

The main learning objective of this course is to prepare the students for:

1 Selecting appropriate tools, equipment's and machines to complete a given job.

2 Performing various welding process using GMAW.

3 Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling.

4 Fabricating gears using gear making machines.

5 Analyzing the defects in the cast and machined components.

LIST OF EXPERIMENTS

1. Fabricating simple structural shapes using Metal Arc Welding machine.
2. Casting aluminum parts using stir casting machine.
3. Taper Turning and Eccentric Turning on circular parts using lathe machine.
4. Knurling, external and internal thread cutting on circular parts using lathe machine.
5. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
6. Drilling and Reaming using vertical drilling machine.
7. Milling contours on plates using vertical milling machine.
8. Cutting spur and helical gear using milling machine.
9. Generating gears using gear hobbing machine.
10. Grinding components using cylindrical, surface, and centerless grinding machine.

Total 60

OUTCOMES: At the end of the course the students would be able to

CO1 Select appropriate tools, equipment and machines to complete a given job.

CO2 Perform various welding process using GMAW.

CO3 Perform various machining process such as rolling, drawing, turning, shaping, drilling, milling.

CO4 Fabricate gears using gear making machines.

Analyse the defects in the cast and machined components.

CO5

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	1	-	1	1	-	1	1	1	-
CO2	3	1	-	-	-	-	1	-	1	1	-	1	1	1	-
CO3	3	1	-	-	-	-	1	-	1	1	-	1	1	1	-
CO4	3	1	-	-	-	-	1	-	1	1	-	1	1	1	-
CO5	3	1	-	-	-	-	1	-	1	1	-	1	1	1	-
CO	3	1	-	-	-	-	1	-	1	1	-	1	1	1	-

SD22301 Coding Skills and Soft Skills Training – Phase I

L	T	P	C
0	0	4	2

Objectives:

1. To make the students to solve basic programming logics.
2. To help the students develop logics using decision control statements.
3. To make the students develop logics using looping statements and arrays and to help them know how automation is implemented in industries.
4. To train the students for effective communication and identify the common errors in formal writings.
5. To guide and motivate the students for setting their goals with positive thinking.

Unit I Fundamentals in Programming 8

Output of Programs: I/O Functions, Data types, Constants, Operators – Mathematical Problems – Debugging – Puzzles - Company Specific Programming Examples.

Unit II Conditional Control Statements 10

Logic Building Using Conditional Control Statements – Output of Programs – Mathematical Problems - Puzzles – Company Specific Programming Examples

Unit III Looping Statements & Automation in Automotive Industries 12

Looping Statements: Number Programs – Programs on Patterns – Array Programs – Programs on Sorting and Searching - Matrix Programs – Puzzles - Output of Programs - Company Specific Programming Examples

Automation in Automotive Industries: Automotive Embedded Product development – Industrial Automation and Control(MOOC)

Unit IV Communication in General 15

Introduction to communication-Types of communication – Effective Communication-Barriers to communication. **Language Study:** Vocabulary-Formation of sentences-Sentence and sentence structures-Common errors – Writing paragraphs & essays. **Professional writing**: Job application & Resume writing

Unit V Personality Development 15

Study of personality & ways to improve. **Soft Skills**: Self-evaluation / self-awareness – Goal setting and positive thinking – Self-esteem and confidence – Public speaking – Extempore – Body language and Observation skills

Suggestive Assessment Methods:

1) Pre Assessment Test – To check the student's previous knowledge in C Programming in written mode.
2) Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20.
3) Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20.
4) Model Exam for coding skills will be conducted for 100 marks which are then calculated to 20.
5) A test for Communication skills will be conducted for 100 marks which will be then calculated to 40.
6) For assignments, students should attend all the practice tests conducted online on Hacker Rank. Each assignment will be for 100 marks and finally the total marks obtained by a student in all tests will be reduced to 40 marks.
7) The total of 100 marks obtained from the tests will be then calculated to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100.

Outcomes

Upon completion of the course, the students will be able to:

CO 1 Solve problems on basic I/O constructs.

CO 2 Develop problem solving skills using control statements and arrays.

CO 3 Implement automation in machines.

CO4 Avoid / fix the common errors they commit in academic and professional writings and prepare standard resumes and update the same for future career.

CO5 Recognize the value of self-evaluation and grow with self-confidence.

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", Second Edition, Pearson Education, 2015.

Reference Books

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.
2. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
3. E Balagurusamy, "Programming in ANSI C", Eighth edition, Mc GrawHill Publications, 2019.
4. S.Sobana, R.Manivannan, G.Immanuel,'Communication and Soft Skills' VK Publications', 2016.
5. Yanja Dajsuren and Mark Van Den Brand, "Automative Systems and Software Engineering: State of the Art and Future Trends", First Edition, Springer Publications, 2019.

CO PO Mapping:

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	1	1	1	-	-	-	1	2	-	-	1
CO2	3	2	2	-	1	1	1	-	-	-	1	2	-	-	1
CO3	3	2	2	-	1	1	1	-	-	-	1	2	1	-	1
CO4	-	-	-	-	-	-	-	1	2	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	1	2	3	-	2	-	-	-
CO	3	2	2	-	1	1	1	1	2	3	1	2	1	-	1

SEMESTER IV

		L	T	P	C
ME22401	**THERMAL ENGINEERING**	**2**	**1**	**2**	**4**

Course Objectives

The main learning objective of this course is to prepare the students for:

1. To predict the operation of thermodynamic cycles and performance of Internal Combustion(IC) engines and Gas Turbines.
2. To learn the working of IC engines and various auxiliary systems present in IC engines
3. To learn the performance of steam turbines through velocity triangles
4. To learn the working of various air compressors
5. To understand the fundamentals of refrigeration and air conditioning

UNIT – I GAS AND STEAM POWER CYCLES 9

Air Standard Cycles — Otto, Diesel, Dual, Brayton — Cycle Analysis, Performance and Comparison — Rankine, reheat and regenerative cycle.

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.

UNIT – III STEAM NOZZLES AND TURBINES 9

Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, Super saturated flow. Impulse and Reaction principles, compounding, velocity diagram for simple and multi-stage turbines, speed regulations –Governors.

UNIT – IV AIR COMPRESSOR 9

Classification and comparison, working principle, work of compression — with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency. Multistage air compressor with Intercooling. Working principle and comparison of Rotary compressors with reciprocating air compressors.

UNIT – V REFRIGERATION AND AIR CONDITIONING 9

Refrigerants – Vapour compression refrigeration cycle – 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.

Practical **30**

List of Experiments:

1. Valve Timing and Port Timing diagrams.
2. Performance Test on four – stroke Diesel Engine.
3. Heat Balance Test on 4 – stroke Diesel Engine.
4. Morse Test on Multi-Cylinder Petrol Engine.
5. Determination of Flash Point and Fire Point of various fuels / lubricants
6. Performance test on a two stage Reciprocating Air compressor
7. Performance and Energy Balance Test on a Steam Generator.

Total **75**

COURSE OUTCOMES: At the end of the course the students would be able to

CO1	Make use of the concepts and laws of thermodynamics to predict the operation of thermodynamic cycles.
CO2	Outline the working of IC engines and various auxiliary systems present in IC engines
CO3	Experiment with the steam turbine and determine its performance and understand the need for governing and compounding of turbines
CO4	Experiment with various air compressors and determine its performance.
CO5	Apply the thermodynamics concept for calculating the cooling/heating load for different applications.

Textbooks:

1	Mahesh. M. Rathore, “Thermal Engineering”, 1st Edition, Tata McGraw Hill, 2010.
2	Ganesan.V , " Internal Combustion Engines" 4th Edition, Tata McGraw Hill, 2012.

References:

1	Ballaney. P, “Thermal Engineering”, 25th Edition, Khanna Publishers, 2017.
2	Domkundwar, Kothandaraman, &Domkundwar, “ A Course in Thermal Engineering”, 6th Edition, DhanpatRai& Sons, 2011.
3	Gupta H.N, “Fundamentals of Internal Combustion Engines”, 2nd Edition Prentice Hall of India, 2013.

4 Mathur M.L and Mehta F.S., "Thermal Science and Engineering", 3rd Edition, Jain Brothers Pvt. Ltd, 2017.

5 Soman. K, "Thermal Engineering", 2nd Edition, Prentice Hall of India, 2011.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	-	-	-	-	1	1	-	1	1	2	-
CO2	3	3	2	1	-	-	-	-	2	1	-	1	1	2	-
CO3	3	3	2	1	-	-	-	-	2	1	-	1	2	1	-
CO4	3	3	2	-	-	-	-	-	2	1	-	1	2	1	-
CO5	3	3	2	1	-	-	-	-	2	2	-	1	2	1	-
CO	3	2	2	1	-	-	-	-	2	1	-	1	1	2	-

ME22402 STRENGTH OF MATERIALS

L	T	P	C
2	1	2	4

Course Objectives

1 To understand the concepts of stress, strain, principal stresses and principal planes

2 To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.

3 To determine stresses and deformation in circular shafts and helical spring due to torsion.

4 To compute slopes and deflections in determinate beams by various methods.

5 To study the stresses and deformations induced in thin and thick shells.

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 BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT – III TORSION 9

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT – IV DEFLECTION OF BEAMS 9

Double Integration method – Macaulay's method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT – V THIN CYLINDERS, SPHERES AND THICK CYLINDERS **9**

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theorem.

Practical **30**

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs

Total **75**

OUTCOMES: At the end of the course the students would be able to

1 Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.

2. Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.

3. Apply basic equation of simple torsion in designing of shafts and helical spring

4. Construct the slope and deflection in beams using different methods.

5. Identify and design thin and thick shells for the applied internal and external pressures.

Textbooks:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016

2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2009

References:

1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2002

2. Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing 'co. Ltd., New Delhi, 2005

3. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2013

4. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2010.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	-	-	-	-	2	1	-	2	2	1	-

CO2	3	2	2	-	-	-	-	-	2	1	-	3	2	2	-
CO3	3	1	3	-	-	-	-	-	2	1	-	3	2	3	-
CO4	3	2	2	-	-	-	-	-	2	-	-	2	2	3	-
CO5	3	1	2	-	-	-	-	-	2	1	-	2	2	3	-
CO	3	2	2	-	-	-	-	-	2	1	-	2	2	1	-

ME22403 ENGINEERING MATERIALS AND METALLURGY

L	T	P	C
3	0	0	3

Course Objectives

1 Constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.

2 Selecting and applying various heat treatment processes and its microstructure formation.

3 Applying the different types of ferrous and non-ferrous alloys and their uses in engineering field.

4 Applying the different polymer, ceramics and composites and their uses in engineering field.

5 Applying the various testing procedures and failure mechanism in engineering field.

UNIT – I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 9

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 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 – Hardenability, Jominy end quench test -case hardening, carburizing, Nitriding, cyaniding – Flame and Induction hardening

UNIT – III FERROUS AND NON-FERROUS METALS 9

Effect of alloying additions on steel (Mn, Si, Cr, Mo, Ni, V, & Ti) – stainless and tool steels – HSLA - Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and its alloys – Brass, Bronze and Cupronickel – Aluminium and its alloys; Al-Cu – precipitation strengthening treatment –Properties and Applications.

UNIT – IV NON-METALLIC MATERIALS 9

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, ABS, Thermoset polymers – Urea and Phenol formaldehydes –Nylon,; Engineering Ceramics – Properties and applications of Al_2O_3, SiC, Si_3N_4, PSZ and SIALON - Composites- Matrix and reinforcement Materials.

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), Impact test lzod and charpy.

Total **45**

OUTCOMES: At the end of the course the students would be able to

CO1. Interpret the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.

CO2. Outline the various heat treatment process and its microstructure formation.

CO3. Illustrate the different types of ferrous and non-ferrous alloys and their uses in engineering field.

CO4. Explain the different polymer, ceramics and composites and their uses in engineering field.

CO5. Summarize the various testing procedures and failure mechanism in engineering field.

Textbooks:

1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint 2002.
2. Sydney H.Avner, "Introduction to Physical Metallurgy", McGraw Hill Book Company, 1994

References:

1. A. Alavudeen, N. Venkateshwaran, and J. T.WinowlinJappes, A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, 2006.
2. Amandeep Singh Wadhwa, andHarvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Sciences Press, 2008.
3. G.S. Upadhyay and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt.Ltd, New Delhi, 2006.
4. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt.Ltd. 1999.
5. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, Revised Indian edition 2007.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2	-	-	1	-	-	1	-	2	-	2	2
CO2	3	2	2	1	-	-	1	-	-	1	-	2	-	2	1
CO3	3	1	3	2	-	-	-	-	-	1	-	2	-	2	1
CO4	3	1	3	-	-	-	-	-	-	-	-	2	-	2	1
CO5	3	3	3	2	-	-	-	-	-	1	-	2	-	-	1
CO	3	2	3	2	-	-	1	-	-	1	-	2	-	2	1

ME22404 MECHANICS OF MACHINES **L T P C**

2 1 2 4

Course Objectives

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 force-motion relationship in components subjected to external forces and analyzing of standard mechanisms.
5	Analyzing the undesirable effects of unbalances resulting from prescribed motions in mechanism and the effect of dynamics of undesirable vibrations.

UNIT – I KINEMATICS OF MECHANISMS 9

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons– relative velocity methods – – cams – classifications – displacement diagrams - layout of plate cam profiles.

UNIT – II GEARS AND GEAR TRAINS 9

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – 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 – Introduction to friction aspects in brakes.

UNIT – IV FORCE ANALYSIS 9

Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle.

UNIT – V BALANCING AND VIBRATION 9

Static and Dynamic balancing – Balancing of rotating masses – Balancing machines – free vibrations – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing.

PRACTICAL - 30

LIST OF EXPERIMENTS

1. Determination of moment of inertia of flywheel and axle system/ body about its axis of symmetry.
2. Undamped free vibrations of a single degree freedom spring-mass system.
3. Torsional Vibration of single rotor shaft system.
4. Dynamic analysis of CAM mechanism.
5. Experiment on Governor.
6. Experiment on motorized gyroscope.
7. Determination of critical speed of shafts.

Total 60

OUTCOMES: At the end of the course the students would be able to

CO1. Apply the basic components of mechanisms, analyze 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.

CO2. Apply the basic concepts of toothed gearing and kinematics of gear trains

CO3. Develope the effects of friction in machine elements

CO4. Organize the force-motion relationship in components subjected to external forces and analyze of standard mechanisms.

CO5. Utilize the undesirable effects of unbalances resulting from prescribed motions in mechanism and the effect of dynamics of undesirable vibrations.

Textbooks:

1. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, 2017.
2. Ramamurthi. V, "Mechanics of Machines", Narosa Publishing House, 2002.

References:

1. AmitabhaGhosh and Asok Kumar Mallik, "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., 1988.
2. Rao.J.S. and Dukkipati.R.V. "Mechanism and Machine Theory", New Age International Pvt. Ltd., 2006.
3. Rattan, S.S, "Theory of Machines", McGraw-Hill Education Pvt. Ltd., 2014.
4. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill, 2009.
5. Wilson and Sadler, Kinematics and Dynamics of Machinery, Pearson, 2008.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	2	-	-	1	1	1	-	1	3	-	1
CO2	3	2	2	1	2	-	-	1	1	1	-	1	3	-	1
CO3	3	2	2	1	2	-	-	1	1	1	-	1	3	-	1
CO4	3	2	2	-	2	-	-	1	1	-	-	1	3	-	1
CO5	3	2	2	1	2	-	-	1	-	1	-	1	3	-	1
CO	3	2	2	1	2	-	-	1	1	1	-	1	3	-	1

ME22405 METROLOGY AND MEASUREMENTS

L	T	P	C
3	0	2	4

Course Objectives

1	Explain the importance of measurements in engineering and the factors affecting measurements and to estimate measurement uncertainty.
2	Apply the working principle and applications of various linear and angular measuring instruments and basic concepts of measurement of assembly and transmission elements.
3	Interpret the various tolerance symbols give n in engineering drawings to choose the appropriate manufacturing process.
4	Apply the principles and methods of form and surface metrology for the intended applications.
5	Use advanced measurements for quality control in manufacturing industries.

UNIT – I BASICS OF METROLOGY 9

Measurement – Need, Process, Role in quality control; Factors affecting measurement - SWIPE; Errors in Measurements – Types – Control – Measurement uncertainty – Types, Estimation, Problems on Estimation of Uncertainty, Statistical analysis of measurement data, Measurement system analysis, Calibration of measuring instruments, Principle of air gauging- ISO standards.

UNIT – II MEASUREMENT OF LINEAR AND ANGULAR DIMENSIONS 9

Linear Measuring Instruments – Vernier caliper, Micrometer, Vernier height gauge, Depth Micrometer, Bore gauge, Telescoping gauge; Gauge blocks – Use and precautions, Comparators – Working and advantages; Opto-mechanical measurements using measuring microscope and Profile projector - Angular measuring instruments – Bevel protractor, Clinometer, Angle gauges, Precision level, Sine bar, Autocollimator, Angle dekkor, Alignment telescope.

UNIT – III TOLERANCE ANALYSIS 9

Tolerancing– Interchangeability, Selective assembly, Tolerance representation, Terminology, Limits and Fits, Problems (using tables IS919); Design of Limit gauges, Problems. Tolerance analysis in manufacturing, Process capability, tolerance stackup, tolerance charting.

UNIT – IV METROLOGY OF SURFACES 9

Fundamentals of GD & T- Conventional vs Geometric tolerance, Datums, Inspection of geometric deviations like straightness, flatness, roundness deviations; Simple problems – Measurement of Surface finish – Functionality of surfaces, Parameters, Comparative, Stylus based and Optical Measurement techniques.

UNIT – V ADVANCES IN METROLOGY 9

Lasers in metrology - Advantages of lasers – Laser scan micrometres; Laser interferometers –Applications – Straightness, Alignment; Ball bar tests, Computer Aided Metrology - Basic concept of CMM – Types of CMM – Constructional features – Probes – Accessories – Software – Applications – Multi-sensor CMMs. Machine Vision - Basic concepts of Machine Vision System.

PRACTICAL 30

LIST OF EXPERIMENTS

1. Calibration and use of linear measuring instruments – Vernier caliper, micrometer, Vernier height gauge, depth micrometer, bore gauge, telescopic gauge, Comparators.
2. Measurement of angles using bevel protractor, sine bar, autocollimator, precision level.
3. Measurement of assembly and transmission elements - screw thread parameters – Screw thread

Micrometers, Three wire method, Toolmaker's microscope.

4. Measurement of gear parameters – Micrometers, Vernier caliper, Gear tester.
5. Surface metrology - Measurement of form parameters – Straightness, Flatness, Roundness, Cylindricity, Perpendicularity, Runout, Concentricity – in the given component using Roundness tester.
6. Measurement of Surface finish in components manufactured using various processes (turning, milling, grinding, etc.,) using stylus based instruments.

Total **75**

OUTCOMES: At the end of the course the students would be able to

1	Explain the importance of measurements in engineering and the factors affecting measurements and to estimate measurement uncertainty.
2	Extend the working principle and applications of various linear and angular measuring instruments and basic concepts of measurement of assembly and transmission elements.
3	Interpret the various tolerance symbols given in engineering drawings to choose the appropriate manufacturing process.
4	Outline the principles and methods of form and surface metrology.
5	Summarize the advances in measurements for quality control in manufacturing Industries.

Textbooks:

1. Dotson Connie, "Dimensional Metrology", Cengage Learning, First edition, 2012.
2. Mark Curtis, Francis T. Farago, "Handbook of Dimensional Measurement", Industrial Press, Fifth edition, 2013.

References:

1. Ammar Grous, J "Applied Metrology for Manufacturing Engineering", Wiley-ISTE, 2011.
2. Galyer, J.F.W. Charles Reginald Shotbolt, "Metrology for Engineers", Cengage Learning EMEA; 5th revised edition, 1990.
3. National Physical Laboratory Guide No. 40, No. 41, No. 42, No. 43, No. 80, No. 118, No. 130, No. 131. http://www.npl.co.uk.
4. Raghavendra N.V. and Krishnamurthy. L., Engineering Metrology and Measurements, Oxford University Press, 2013 .
5. Venkateshan, S. P., "Mechanical Measurements", Second edition, John Wiley &Sons, 2015.

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	2		-	-	2	2		-	1	-	1	1
CO2	2	1	3	2		-	-	-	2	2	-	1	3	3	
CO3	2	2	2	2		-	-	-	-	-	-	1	3	2	-
CO4	1	3	-	3	2	-	-	-	-	-	-	1	3	3	-

CO5	1	1	-	3	3	-	-	-	-	-	-	1	3	3	-
CO	2	2	2	3	2	-	-	2	2	2	-	1	3	2	1

AC22401 INDUSTRIAL SAFETY ENGINEERING

L	T	P	C
2	0	0	0

Course Objectives

1 Explaining the fundamental concept and principles of industrial safety

2 Applying the principles of maintenance engineering.

3 Analyzing the wear and its reduction.

4 Evaluating faults in various tools, equipments and machines.

5 Applying periodic maintenance procedures in preventive maintenance.

UNIT – I INDUSTRIAL SAFETY **9**

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT – II MAINTENANCE ENGINEERING **9**

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT – III WEAR AND CORROSION AND THEIR PREVENTION **9**

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT – IV FAULT TRACING **9**

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT – V PERIODIC AND PREVENTIVE MAINTENANCE **9**

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor,

repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, Advantages of preventive maintenance. Repair cycle concept and importance.

Total **45**

OUTCOMES: At the end of the course the students would be able to

1. Explain the fundamental concept and principles of industrial safety
2. Apply the principles of maintenance engineering.
3. Analyze the wear and its reduction.
4. Evaluate faults in various tools, equipments and machines
5. Apply periodic maintenance procedures in preventive maintenance.

Textbooks:

1. L M Deshmukh, Industrial Safety Management, Tata McGraw-Hill Education, 2005.
2. Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, CRC Press, 2003.

References:

1. Edward Ghali, V. S. Sastri, M. Elboujdaini, Corrosion Prevention and Protection: Practical Solutions, John Wiley & Sons, 2007.
2. Garg, HP, Maintenance Engineering, S. Chand Publishing.
3. J Maiti, Pradip Kumar Ray, Industrial Safety Management: 21st Century Perspectives of Asia, Springer, 2017.
4. R. Keith Mobley, Maintenance Fundamentals, Elsevier, 2011.
5. W. E. Vesely, F. F. Goldberg, Fault Tree Handbook, Create space Independent Pub, 2014

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO2	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO3	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO4	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1
CO5	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1

CO	2	1	2	-	-	2	1	-	-	-	-	1	1	2	1

SD22401 Coding Skills and Soft Skills Training – Phase II

L	T	P	C
0	0	4	2

Objectives

1. To help students on developing modular applications in using functions.
2. To train them on building logics using strings and pointers.
3. To make them develop applications in using user defined data types and to make them know how automation is implemented in industries.
4. To train the students on speaking skills for group discussions.
5. To set them correctly on the track of presentation skills and management skills.

Unit I Functions **10**

Logic Building Using Functions – Programs on Recursion – Puzzles - Output of Programs - Company Specific Programming Examples

Unit II Strings and Pointers **10**

Logic Building Using Strings – Programs on Strings - Logic Building Using Pointers – Puzzles - Output of Programs - Company Specific Examples

Unit III User Defined Data types & Automation in Automotive Industries **10**

User Defined Data types: Working with User Defined Data types – Puzzles - Output of Programs - Company Specific Examples

Automation in Automotive Industries: Embedded Firmware Development – Core of the Embedded System – General Purpose and Domain Specific Processors, ASICs, PLDs, COTS.

Unit IV Communication Skills / Language Skills **15**

Receptive Skills and productive skills - Skills together - Integration of skills - Input and output **Receptive Skills**: Listening and Reading - Lead-in - Pre-existent knowledge - General understanding of the audio or the written text - Discussion in pairs or small groups – feedback - Text-related task in detail - Focus on aspects of language in the text. **Productive Skills**: Speaking and Writing - lead-in - engaging students with the topic - setting the task - role-play - Monitoring the task - Giving the feedback-positive- task-related follow up - repetition / re-setting of task. **Activities:** Pronunciation: syllable, stress, intonation - Writing memos, e-mails and formal letters - Oral presentations / seminars -

Written and Oral Descriptions Group discussions.

Unit V Soft Skills: Search and find for Career Developments 15

Self-motivation: Interpersonal relationship - Attitudes and interpersonal integrity – Time management – prioritizing - Leadership quality – **In the team:** Team building and Team work - Memory technique **Problem solving**: – emotional intelligence – positive attitude towards life – taking up initiatives – developing mind set –openness to feed back – adaptability – active listening – work ethics. **Presentation of skills**: creative thinking – critical thinking – logical thinking - decision making. **Management ability:** empathy – selflessness – humility – cultural respectfulness – versatility – generosity – trustworthiness – planning and executing – target achievement – listening to others' views – friendliness - active participation – empowering healthy atmosphere – exchange of ideas – mediation – negotiation – qualities – updating the knowledge – pre-work for performance – respect for rules and regulations

Suggestive Assessment Methods:

1) Pre Assessment Test – To check the student's previous knowledge in C Programming in written mode.
2) Internal Assessment I for coding skills will be conducted for 100 marks which are then calculated to 20.
3) Internal Assessment II for coding skills will be conducted for 100 marks which are then calculated to 20.
4) Model Exam for coding skills will be conducted for 100 marks which are then reduced to 20
5) A test for Communication skills will be conducted for 100 marks which will be then calculated to 40.
6) For assignments, students should attend all the practice tests conducted online on HackerRank. Each assignment will be for 100 marks and finally the total marks obtained by a student in all tests will be reduced to 40 marks.
7) The total of 100 marks obtained from the tests will be then reduced to 60 marks and additional of 40 marks will be given for assignments which will make it a total of 100.

Outcomes

Upon completion of the course, the students will be able to:

CO 1 Develop and implement modular applications in functions.

CO 2 Design and implement applications using strings and user defined data types.

CO 3 Implement automation in machines.

CO4 Practice both receptive skills (listening and reading) and productive skills (writing and speaking) and speak English with standard pronunciation using correct stress and

intonation.

CO5 Practice team building and team work procedures and develop memory techniques and Manage abilities like empathy, selflessness, cultural respectfulness and trustworthiness preparing themselves for target achievement.

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", Second Edition, Pearson Education, 2015.

Reference Books

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.
2. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
3. E Balagurusamy, "Programming in ANSI C", Eighth edition, Mc GrawHill Publications, 2019.
4. S.Sobana, R.Manivannan, G.Immanuel,'Communication and Soft Skills' VK Publications', 2016.
5. Yanja Dajsuren and Mark Van Den Brand, "Automative Systems and Software Engineering: State of the Art and Future Trends", First Edition, Springer Publications, 2019.

CO PO Mapping:

Course outcomes	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	1	1	1	-	-	-	1	2	-	-	1
CO2	3	2	2	-	1	1	1	-	-	-	1	2	-	-	1
CO3	3	2	2	-	1	1	1	-	-	-	1	2	1	-	1
CO4	-	-	-	-	-	-	-	1	2	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	1	2	3	-	2	-	-	-
CO	3	2	2	-	1	1	1	1	2	3	1	2	1	-	1