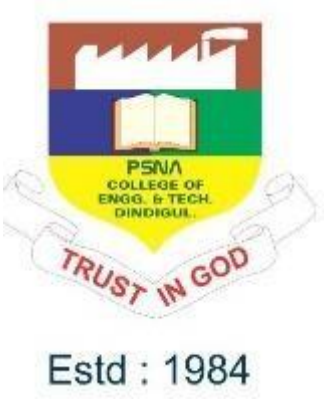
PSNA College of Engineering and Technology

(An Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai)

Dindigul – 624 622.



B.E: MECHANICAL ENGINEERING

Curriculum for Regulations 2022

(Choice Based Credit System)

For the Students admitted in the Academic year 2022-23 onwards

November 2022

PSNA College of Engineering and Technology, Dindigul – 624 622

(An Autonomous Institution Affiliated to Anna University, Chennai)

FIRST MEETING OF THE ACADEMIC COUNCIL

18th November 2022

Regulations R 2022

B.E., Mechanical Engineering

Approved copy of Curriculum (1-8) semesters and syllabus (1 and 2 semesters)

Sl. No	Name and Affiliation	Signature
Chairman		
1.	**Dr. D. Vasudevan,** Principal and Chairman of Academic Council, PSNACET.	
Registrar		
2.	**Dr. C. Jayaguru,** Registrar – Academic, PSNACET.	
Chairman -Board of Studies		
3.	**Dr.R.Kannan** Professor and Head, Department of Mechanical Engineering, PSNACET.	

PSNA College of Engineering & Technology, Dindigul – 624 622.

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Estd : 1984

REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM

B.E. MECHANICAL ENGINEERING

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

1. PEO1: Our mechanical engineering graduates will be competent world class engineers with a commitment to profession and ethics.
2. PEO2: Our mechanical engineering graduates will have a successful career as managers, administrators and entrepreneurs throughout the world where an engineering approach to problem solving and ability to independent learning is highly valued.
3. PEO3: Our mechanical engineering graduates will act as an effective and contributing team member in research and academia.

II. PROGRAMME OUTCOMES (POs)

Mechanical Engineering Graduates will be able to:

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 conditions.
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 practices.
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. PROGRAMME SPECIFIC OUTCOMES (PSO)

1. Graduates will demonstrate the ability to develop product design, product lifecycle management and enterprise resource planning.
2. Graduates will demonstrate the ability to adopt the global demands in sustainable mobility.

PSNA COLLEGE OF ENGINEERING AND TECHNOLOGY, DINDIGUL-624 622.

AN AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY

REGULATION 2022

CHOICE BASED CREDIT SYSTEM

B.E. MECHANICAL ENGINEERING

CURRICULUM AND SYLLABI

SEMESTER-I

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Induction Programme	-	-	-	-	-	0
THEORY								
2.	HS2121	Professional English and Functional skills	HSMC	3	0	2	5	4
3.	MA2122	Calculus for Engineers	BSC	3	1	0	4	4
4.	PH2123	Engineering Physics	BSC	3	0	0	3	3
5.	CY2124	Engineering Chemistry	BSC	3	0	0	3	3
6.	GE2125	Problem Solving and Python Programming	ESC	3	0	0	3	3
PRACTICALS								
7.	GE2181	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
8.	BS2182	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
TOTAL				**15**	**1**	**10**	**26**	**21**

SEMESTER–II

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS2221	Communicative English	HSMC	2	0	0	2	2
2.	MA2221	Integrals and Complex Functions	BSC	3	1	0	4	4
3.	PH2212	Physics for Mechanical Engineering	BSC	3	0	0	3	3
4.	GE2221	Engineering Graphics	ESC	2	0	4	6	4
5.	EC2214	Fundamentals of Electrical and Electronics Engineering	ESC	3	0	0	3	3
6.		NCC Credit Course Level I[#]	-	2	0	0	2	2[#]
PRACTICALS								
7.	GE2281	Engineering Practices Laboratory	ESC	0	0	4	4	2
8.	EC2281	Fundamentals of Electrical and Electronics Engineering Laboratory	ESC	0	0	3	3	1.5
9.	HS2281	Communication and Soft Skills Laboratory	EEC	0	0	3	3	1.5
TOTAL				**13**	**1**	**14**	**28**	**21**

[#]NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA

SEMESTER–III

SL. NO.	COURSE CODE	COURSETITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA2324	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2.	ME2311	Engineering Mechanics	ESC	3	0	0	3	3
3.	ME2312	Engineering Thermodynamics	PCC	3	0	0	3	3
4.	ME2313	Fluid Mechanics and Machinery	ESC	3	1	0	4	4
5.	ME2314	Engineering Materials and Metallurgy	PCC	3	0	0	3	3
6.	ME2315	Manufacturing Processes	PCC	3	0	0	3	3
PRACTICALS								
7.	ME2381	Computer Aided Machine Drawing	ESC	0	0	4	4	2
8.	ME2382	Manufacturing Technology Laboratory	PCC	0	0	4	4	2
9.	GE2381	Professional Development[$]	EEC	0	0	2	2	1
TOTAL				**18**	**2**	**10**	**30**	**25**

[$]Skill Based Course

SEMESTER–IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	ME2411	Theory of Machines	PCC	3	0	0	3	3
2.	ME2412	Thermal Engineering	PCC	4	0	0	4	4
3.	ME2413	Hydraulics and Pneumatics	PCC	3	0	0	3	3
4.	ME2414	Manufacturing Technology	PCC	3	0	0	3	3
5.	ME2415	Strength of Materials for Mechanical Engineers	PCC	3	0	0	3	3
6.	GE2421	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
7.		NCC Credit Course Level2[#]	-	3	0	0	3	3[#]
PRACTICALS								
8.	ME2481	Strength of Materials and Fluid Machinery Laboratory	PCC	0	0	4	4	2
9.	ME2482	Thermal Engineering Laboratory	PCC	0	0	4	4	2
TOTAL				**18**	**0**	**8**	**26**	**22**

[#]NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER–V

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODSPER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	ME2511	Design of Machine Elements	PCC	4	0	0	4	4
2.	ME2512	Metrology and Measurements	PCC	3	0	0	3	3
3	ME2513	Computer Integrated Manufacturing	PCC	3	0	0	3	3
4.	ME2VXX	Professional Elective I	PEC	-	-	-	-	3
5.	ME2VXX	Professional Elective II	PEC	-	-	-	-	3
6.	ME2VXX	Professional Elective III	PEC	-	-	-	-	3
7	MX256X	Mandatory Course-I[&]	MC	3	0	0	3	0
PRACTICALS								
8	ME2581	Metrology and Dynamics Laboratory	PCC	0	0	4	4	2
9	ME2582	Summer Internship*	EEC	0	0	0	0	1
TOTAL				-	**-**	**-**	**-**	**22**

***Two weeks Summer Internship carries one credit and it will be done during IV semester summer vacation and same will be evaluated in V semester.

[&]Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I).

SEMESTER–VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	ME2611	Heat and Mass Transfer	PCC	3	1	0	4	4
2.	ME2VXX	Professional Elective IV	PEC	-	-	-	-	3
3.	ME2VXX	Professional Elective V	PEC	-	-	-	-	3
4.	ME2VXX	Professional Elective VI	PEC	-	-	-	-	3
5.	ME2VXX	Professional Elective VII	PEC	-	-	-	-	3
6	XX2OXX	Open Elective–I*	OEC	3	0	0	3	3
7	MX266X	Mandatory Course-II[&]	MC	3	0	0	3	0
8		NCC Credit Course Level3[#]	-	3	0	0	3	3[#]
PRACTICALS								
9.	ME2681	CAD/CAM Laboratory	PCC	0	0	4	4	2
10.	ME2682	Heat Transfer Laboratory	PCC	0	0	4	4	2
11	ME2683	Design and Fabrication Project	EEC	0	0	4	4	2
TOTAL				-	-	-	-	**25**

*Open Elective–I shall be chosen from the emerging technologies.

[&]Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under MC-II).

[#]NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER–VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	ME2711	Mechatronics and IoT	PCC	3	0	0	3	3
2.	GE2721	Human Values and Ethics	HSMC	2	0	0	2	2
3.	GE2736	Industrial Management	HSMC	3	0	0	3	3
4.	XX2OXX	Open Elective–II**	OEC	-	-	-	-	3
5	XX2O3X	Open Elective–III***	OEC	-	-	-	-	3
6	XX2O4X	Open Elective–IV***	OEC	-	-	-	-	3
PRACTICALS								
7	ME2781	Mechatronics and IoT Laboratory	PCC	0	0	4	4	2
8	ME2782	Summer Internship[#]	EEC	0	0	0	0	1
TOTAL				-	-	-	-	**20**

#Two weeks Summer Internship carries one credit and it will be done during VI semester summer vacation and same will be evaluated in VII semester.

*If students undergo internship in Semester VII , the n the courses offered during semester VII will be offered during semester VIII.

**Open Elective–II shall be chosen from the emerging technologies.

***Open Elective III and IV (Shall be chosen from the list of open electives offered by other Programmes).

SEMESTER–VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	ME2891	Project Work / Internship	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

*If students undergo internship in Semester VII, the n the courses offered during semester VII will be offered during semester VIII.

TOTAL CREDITS: 166

MANDATORY COURSES I

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX2561	Introduction to Women and Gender Studies	MC	3	0	0	3	0
2.	MX2562	Elements of Literature	MC	3	0	0	3	0
3.	MX2563	Film Appreciation	MC	3	0	0	3	0
4.	MX2564	Disaster Management	MC	3	0	0	3	0

MANDATORY COURSES II

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX2661	Well Being with traditional practices(Yoga, Ayurveda and Siddha)	MC	3	0	0	3	0
2.	MX2662	History of Science and Technology In India	MC	3	0	0	3	0
3.	MX2663	Political and Economic Thought for a Humane Society	MC	3	0	0	3	0
4.	MX2664	State, Nation Building and Politics in India	MC	3	0	0	3	0
5.	MX2665	Industrial Safety	MC	3	0	0	3	0

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1	VERTICAL 2	VERTICAL 3	VERTICAL 4	VERTICAL 5	VERTICAL 6	VERTICAL 7	VERTICAL 8	VERTICAL9	VERTICAL 10 / K11	VERTICAL 11 / K21
MODERN MOBILITY SYSTEMS	**PRODUCT AND PROCESS DEVELOPMENT**	**ROBOTICS AND AUTOMATION**	**DIGITAL AND GREEN MANUFACTURING**	**PROCESS EQUIPMENT AND PIPING DESIGN**	**CLEAN AND GREEN ENERGY TECHNOLOGIES**	**COMPUTATIONAL ENGINEERING**	**LOGISTICS AND SUPPLYCHAIN MANAGEMENT**	**DIVERSIFIED COURSES GROUP1**	**DIVERSIFIED COURSES GROUP2**	**DIVERSIFIED COURSES GROUP3**
Automotive Materials, Components, Design &Testing	Value Engineering	Sensors and Instrumentation	Digital Manufacturing and IoT	Design of Pressure Vessels	Bio energy Conversion Technologies	Computational Solid Mechanics	Automation in Manufacturing	Automobile Engineering	Turbo Machines	Advanced Vehicle Engineering
Conventional and Futuristic Vehicle Technology	Additive Manufacturing	Electrical Drives and Actuators	Lean Manufacturing	Failure Analysis and NDT Techniques	Carbon Foot print estimation and reduction techniques	Computational Fluid Dynamics and Heat transfer	Ware housing Automation	Measurements and Controls	Non-traditional Machining Processes	Advanced Internal Combustion Engineering
Renewable Powered Off Highway Vehicles and Emission Control Technology	CAD/CAM	Embedded Systems and Programming	Modern Robotics	Material Handling and solid processing Equipment	Energy Conservation in Industries	Theory on Computation and Visualization	Material Handling Equipment, Repair and Maintenance	Design Concepts in Engineering	Industrial safety	Casting and Welding Processes
Vehicle Health Monitoring, Maintenance and Safety	Design For X	Robotics	Green Manufacturing Design and Practices	Rotating Machinery Design	Energy Efficient Buildings	Computational Bio-Mechanics	Robotics	Composite Materials and Mechanics	Design of Transmission System	Process Planning and Cost Estimation
CAE and CFD Approach in Future Mobility	Ergonomics in Design	Smart Mobility and Intelligent Vehicles	Environment Sustainability and Impact Assessment	Thermal and Fired Equipment design	Energy Storage Devices	Advanced Statistics and Data Analytics	Container Logistics	Electrical Drives and Control	Thermal Power Engineering	Surface Engineering

VERTICAL 1	VERTICAL 2	VERTICAL 3	VERTICAL 4	VERTICAL 5	VERTICAL 6	VERTICAL 7	VERTICAL 8	VERTICAL9	VERTICAL 10 / K11	VERTICAL 11 / K21
MODERN MOBILITY SYSTEMS	**PRODUCT AND PROCESS DEVELOPMENT**	**ROBOTICS AND AUTOMATION**	**DIGITAL AND GREEN MANUFACTURING**	**PROCESS EQUIPMENT AND PIPING DESIGN**	**CLEAN AND GREEN ENERGY TECHNOLOGIES**	**COMPUTATIONAL ENGINEERING**	**LOGISTICS AND SUPPLYCHAIN MANAGEMENT**	**DIVERSIFIED COURSES GROUP1**	**DIVERSIFIED COURSES GROUP2**	**DIVERSIFIED COURSES GROUP3**
Hybrid and Electric Vehicle Technology	New Product Development	Haptics and Immersive Technologies	Energy Saving Machinery and Components	Industrial Layout Design and Safety	Renewable Energy Technologies	CAD and CAE	Logistics in Manufacturing, Supply Chain and Distribution	Power Plant Engineering	Design for Manufacturing	Precision Manufacturing
Thermal Management of Batteries and Fuel Cells	Product Life Cycle Management	Drone Technologies	Green Supply Chain Management	Design Codes and Standards	Equipment for Pollution Control	Machine Learning for Intelligent Systems	Data Science	Refrigeration and Air Conditioning	Power Generation Equipment Design	Gas Dynamics and Jet Propulsion
-	-	-	-	-	-	-	-	Dynamics of Ground Vehicles	Engineering Economics and Cost Analysis	Operational Research

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI. The registration of courses for B.E./ B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/ B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2022, Clause 4.10.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: MODERN MOBILITY SYSTEMS

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V11	Automotive Materials, Components, Design & Testing	PEC	2	0	2	4	3
2.	ME2V12	Conventional and Futuristic Vehicle Technology	PEC	3	0	0	3	3
3.	ME2V13	Renewable Powered Off Highway Vehicles and Emission Control Technology	PEC	3	0	0	3	3
4.	ME2V14	Vehicle Health Monitoring, Maintenance and Safety	PEC	3	0	0	3	3
5.	ME2V15	CAE and CFD Approach in Future Mobility	PEC	2	0	2	4	3
6.	ME2V16	Hybrid and Electric Vehicle Technology	PEC	3	0	0	3	3
7.	ME2V17	Thermal Management of Batteries and Fuel Cells	PEC	3	0	0	3	3

VERTICAL 2: PRODUCT AND PROCESS DEVELOPMENT

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V21	Value Engineering	PEC	3	0	0	3	3
2.	ME2V22	Additive Manufacturing	PEC	2	0	2	4	3
3.	ME2V23	CAD/CAM	PEC	3	0	0	3	3
4.	ME2V24	Design For X	PEC	3	0	0	3	3
5.	ME2V25	Ergonomics in Design	PEC	3	0	0	3	3
6.	ME2V26	New Product Development	PEC	3	0	0	3	3
7.	ME2V27	Product Life Cycle Management	PEC	3	0	0	3	3

VERTICAL 3: ROBOTICS AND AUTOMATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V31	Sensors and Instrumentation	PEC	3	0	0	3	3
2.	ME2V32	Electrical Drives and Actuators	PEC	3	0	0	3	3
3.	ME2V33	Embedded Systems and Programming	PEC	2	0	2	4	3
4.	ME2V34	Robotics	PEC	3	0	0	3	3
5.	ME2V35	Smart Mobility and Intelligent Vehicles	PEC	3	0	0	3	3
6.	ME2V36	Haptics and Immersive Technologies	PEC	3	0	0	3	3
7.	ME2V37	Drone Technologies	PEC	3	0	0	3	3

VERTICAL 4: DIGITAL AND GREEN MANUFACTURING

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V41	Digital Manufacturing and IoT	PEC	2	0	2	4	3
2.	ME2V42	Lean Manufacturing	PEC	3	0	0	3	3
3.	ME2V43	Modern Robotics	PEC	2	0	2	4	3
4.	ME2V44	Green Manufacturing Design And Practices	PEC	3	0	0	3	3
5.	ME2V45	Environment Sustainability And Impact Assessment	PEC	3	0	0	3	3
6.	ME2V46	Energy Saving Machinery And Components	PEC	3	0	0	3	3
7.	ME2V47	Green Supply Chain Management	PEC	3	0	0	3	3

VERTICAL 5: PROCESS EQUIPMENT AND PIPING DESIGN

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V51	Design of Pressure Vessels	PEC	3	0	0	3	3
2.	ME2V52	Failure Analysis and NDT Techniques	PEC	2	0	2	4	3
3.	ME2V53	Material Handling and Solid Processing Equipment	PEC	3	0	0	3	3
4.	ME2V54	Rotating Machinery Design	PEC	3	0	0	3	3
5.	ME2V55	Thermal and Fired Equipment Design	PEC	3	0	0	3	3
6.	ME2V56	Industrial Layout Design and Safety	PEC	2	0	2	4	3
7.	ME2V57	Design Codes and Standards	PEC	3	0	0	3	3

VERTICAL 6: CLEAN AND GREEN ENERGY TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V61	Bio energy Conversion Technologies	PEC	3	0	0	3	3
2.	ME2V62	Carbon Foot print Estimation and Reduction Techniques	PEC	3	0	0	3	3
3.	ME2V63	Energy Conservation in Industries	PEC	3	0	0	3	3
4.	ME2V64	Energy Efficient Buildings	PEC	3	0	0	3	3
5.	ME2V65	Energy Storage Devices	PEC	3	0	0	3	3
6.	ME2V66	Renewable Energy Technologies	PEC	3	0	0	3	3
7.	ME2V67	Equipment for Pollution Control	PEC	3	0	0	3	3

VERTICAL 7: COMPUTATIONAL ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V71	Computational Solid Mechanics	PEC	3	0	0	3	3
2.	ME2V72	Computational Fluid Dynamics And Heat transfer	PEC	3	0	0	3	3
3.	ME2V73	Theory on Computation and Visualization	PEC	3	0	0	3	3
4.	ME2V74	Computational Bio-Mechanics	PEC	3	0	0	3	3
5.	ME2V75	Advanced Statistics and Data Analytics	PEC	3	0	0	3	3
6.	ME2V76	CAD and CAE	PEC	2	0	2	4	3
7.	ME2V77	Machine Learning for Intelligent Systems	PEC	3	0	0	3	3

VERTICAL 8: LOGISTICS AND SUPPLY CHAIN MANAGEMENT

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2V81	Automation in Manufacturing	PEC	3	0	0	3	3
2.	ME2V82	Ware housing Automation	PEC	3	0	0	3	3
3.	ME2V83	Material Handling Equipment, Repair and Maintenance	PEC	3	0	0	3	3
4.	ME2V84	Robotics	PEC	3	0	0	3	3
5.	ME2V85	Container Logistics	PEC	3	0	0	3	3
6.	ME2V86	Logistics in Manufacturing, Supply Chain and Distribution	PEC	3	0	0	3	3
7.	ME2V87	Data Science	PEC	3	0	0	3	3

VERTICAL 9: DIVERSIFIED COURSES GROUP 1

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONT ACT PERIODS	CREDITS
				L	T	P		
1.	ME2V91	Automobile Engineering	PEC	3	0	0	3	3
2.	ME2V92	Measurements and Controls	PEC	3	0	0	3	3
3.	ME2V93	Design Concepts in Engineering	PEC	3	0	0	3	3
4.	ME2V94	Composite Materials and Mechanics	PEC	3	0	0	3	3
5.	ME2V95	Electrical Drives and Control	PEC	3	0	0	3	3
6.	ME2V96	Power Plant Engineering	PEC	3	0	0	3	3
7.	ME2V97	Refrigeration and Air Conditioning	PEC	3	0	0	3	3
8.	ME2V98	Dynamics of Ground Vehicles	PEC	3	0	0	3	3

VERTICAL 10/K1: DIVERSIFIED COURSES GROUP 2

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2K11	Turbo Machines	PEC	3	0	0	3	3
2.	ME2K12	Non-traditional Machining Processes	PEC	3	0	0	3	3
3.	ME2K13	Industrial safety	PEC	3	0	0	3	3
4.	ME2K14	Design of Transmission System	PEC	3	0	0	3	3
5.	ME2K15	Thermal Power Engineering	PEC	3	0	0	3	3
6.	ME2K16	Design for Manufacturing	PEC	3	0	0	3	3
7.	ME2K17	Power Generation Equipment Design	PEC	3	0	0	3	3
8	ME2K18	Engineering Economics and Cost Analysis	PEC	3	0	0	3	3

VERTICAL11/K2: DIVERSIFIED COURSES GROUP 3

SL. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	ME2K21	Advanced Vehicle Engineering	PEC	3	0	0	3	3
2.	ME2K22	Advanced Internal Combustion Engineering	PEC	3	0	0	3	3
3.	ME2K23	Casting and Welding Processes	PEC	3	0	0	3	3
4.	ME2K24	Process Planning and Cost Estimation	PEC	3	0	0	3	3
5.	ME2K25	Surface Engineering	PEC	3	0	0	3	3
6.	ME2K26	Precision Manufacturing	PEC	3	0	0	3	3
7.	ME2K27	Gas Dynamics and Jet Propulsion	PEC	3	0	0	3	3
8.	ME2K28	Operational Research	PEC	3	0	0	3	3

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AD2O15	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3
2.	CS2O11	Augmented and Virtual Reality	OEC	3	0	0	3	3
3.	IT2O12	Data Science Fundamentals	OEC	3	0	0	3	3
4.	IT2O11	IoT Concepts and Applications	OEC	3	0	0	3	3

OPEN ELECTIVES–III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	CS2O32	Fundamentals of Data Structures	OEC	3	0	0	3	3
2	CS2O33	Software Engineering	OEC	3	0	0	3	3
3	CS2O34	Database management systems	OEC	3	0	0	3	3
4	EC2O31	Wireless Communication	OEC	3	0	0	3	3
5	EC2O34	Speech Processing	OEC	3	0	0	3	3
6	AD2O21	Big data Analytics	OEC	3	0	3	3	3
7	AD2O22	Crypto currency & Block chain Technology	OEC	3	0	0	3	3
8	CB2O31	Introduction to C Programming	OEC	3	0	0	3	3
9	IT2O33	IOS APP Development	OEC	2	0	2	4	3
10	IT2O34	Networking Design and Security	OEC	3	0	0	3	3

OPEN ELECTIVES–IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	BM2O44	Wearable Devices	OEC	3	0	0	3	3
2	CS2O41	Deep Learning	OEC	3	0	0	3	3
3	EC2O44	Fundamentals of Nano Electronics	OEC	3	0	0	3	3
4	EC2O45	MEMS Design	OEC	3	0	0	3	3
5	EC2O46	RF System Design and Testing	OEC	3	0	0	3	3
6	AD2O42	Telehealth Technology	OEC	3	0	0	3	3
7	AD2O44	Full Stack Development	OEC	3	0	0	3	3
8	CB2O42	Applied Design Thinking	OEC	3	0	0	3	3
9	AD2O43	Business Analytics	OEC	3	0	0	3	3
10	IT2O43	Industrial IoT and Industry 4.0	OEC	3	0	0	3	3

B.E.MECHANICAL ENGINEERING										
S.No	Subject Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	4	2					5		11
2	BSC	12	7	4	2					25
3	ESC	5	10.5	9						24.5
4	PCC			11	20	12	8	5		56
5	PEC					9	12			21
6	OEC						3	9		12
7	EEC		1.5	1		1	2	1	10	16.5
8	Non-Credit/Mandatory					√	√			
Total		21	21	25	22	22	25	20	10	166

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Complete details are available in clause 4.10 of Regulation 2022.

VERTICALS FOR MINOR DEGREE

(In addition to all the verticals of other programmes)

Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V
Fintech and Block Chain	**Entrepreneurship**	**Public Administration**	**Business Data Analytics**	**Environment and Sustainability**
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development
Fundamental of Investment	Team Building and Leadership Management for Business	Constitution of India	Data mining forBusiness Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Block chain and its Application	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiencyfor Sustainable Development

(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL 1 : FINTECH ANDBLOCK CHAIN

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG331	Financial Management	PEC	3	0	0	3	3
2.	CMG332	Fundamental of Investment	PEC	3	0	0	3	3
3.	CMG333	Banking, Financial Services and Insurance	PEC	3	0	0	3	3
4.	CMG334	Introduction to Block chain and its Application	PEC	3	0	0	3	3
5.	CMG335	Fintech Personal Finance and Payments	PEC	3	0	0	3	3
6.	CMG336	Introduction to Fintech	PEC	3	0	0	3	3

VERTICAL 2: ENTREPRENERUSHIP

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG337	Foundations of Entrepreneruship	PEC	3	0	0	3	3
2.	CMG338	Team Building and Leadership Management for Business	PEC	3	0	0	3	3
3.	CMG339	Creativity and Innovation in Entrepreneurship	PEC	3	0	0	3	3
4.	CMG340	Principles of Marketing Management for Business	PEC	3	0	0	3	3
5.	CMG341	Human Resource Management for Entrepreneurs	PEC	3	0	0	3	3
6.	CMG342	Financing New Business Ventures	PEC	3	0	0	3	3

VERTICAL 3: PUBLIC ADMINISTRATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG343	Principles of Public Administration	PEC	3	0	0	3	3
2.	CMG344	Constitution of India	PEC	3	0	0	3	3
3.	CMG345	Public Personnel Administration	PEC	3	0	0	3	3
4.	CMG346	Administrative Theories	PEC	3	0	0	3	3
5.	CMG347	Indian Administrative System	PEC	3	0	0	3	3
6.	CMG348	Public Policy Administration	PEC	3	0	0	3	3

VERTICAL 4: BUSINESS DATA ANALYTICS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG349	Statistics for Management	PEC	3	0	0	3	3
2.	CMG350	Data mining for Business Intelligence	PEC	3	0	0	3	3
3.	CMG351	Human Resource Analytics	PEC	3	0	0	3	3
4.	CMG352	Marketing and Social Media Web Analytics	PEC	3	0	0	3	3
5.	CMG353	Operation and Supply Chain Analytics	PEC	3	0	0	3	3
6.	CMG354	Financial Analytics	PEC	3	0	0	3	3

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	CMG355	Sustainable infrastructure Development	PEC	3	0	0	3	3
2.	CMG356	Sustainable Agriculture and Environmental Management	PEC	3	0	0	3	3
3.	CMG357	Sustainable Bio Materials	PEC	3	0	0	3	3
4.	CMG358	Materials for Energy Sustainability	PEC	3	0	0	3	3
5.	CMG359	Green Technology	PEC	3	0	0	3	3
6.	CMG360	Environmental Quality Monitoring and Analysis	PEC	3	0	0	3	3
7	CMG361	Integrated Energy Planning for Sustainable Development	PEC	3	0	0	3	3
8	CMG362	Energy Efficiency for Sustainable Development	PEC	3	0	0	3	3

INDUCTION PROGRAMME

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

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

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

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

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

(iii) Universal Human Values This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, make decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules This would address some lacunas that students might have, for example, English, computer familiarity etc.

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

(vii) Visits to Local Area A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

(viii) Familiarization to Dept./Branch & Innovations They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering / Technology / Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

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

References:

Guide to Induction program from AICTE.

HS2121 PROFESSIONAL ENGLISH & FUNCTIONAL SKILLS L T P C

3 0 2 4

COURSE OBJECTIVES:

1. To improve the communicative competence of the learners.
2. To help the learners use the English language effectively in academic and work contexts.
3. To enrich the English language skills of the students by engaging them in LSRW activities.
4. To develop the learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
5. To use the English language efficiently in expressing their opinions through various media.

UNIT- I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 9

Writing - Writing emails / formal and informal letters - **Grammar -** Present Tense; Question types: Wh/ Yes or No / and Tags - **Vocabulary** - Synonyms; One word substitution.

UNIT- II NARRATION AND SUMMATION 9

Writing – Reading comprehension skills- Report on an event (field trip, etc.), Dialogue writing- **Grammar** – Past tense; Subject-Verb Agreement and Prepositions - **Vocabulary** - Synonyms and Antonyms, Phrasal verbs.

UNIT- III DESCRIPTION OF A PROCESS / PRODUCT 9

Writing - Writing single line definitions; instructions; and Product / Process description - **Grammar** - Imperatives; Adjectives; Degrees of comparison - **Vocabulary** - Homonyms and Homophones.

UNIT- IV CLASSIFICATION AND RECOMMENDATIONS 9

Writing – Note-making / Note-taking - Writing recommendations; Transferring information from non verbal (chart, graph, etc. to verbal mode) - **Grammar** – Articles; Pronouns - Relative pronouns - **Vocabulary** - Collocations.

UNIT- V EXPRESSION 9

Writing – Essay Writing (Descriptive or narrative) - **Grammar** – Future Tenses, Negation (Statements & Questions) - **Vocabulary** - Cause & Effect Expressions, Abbreviations & Acronyms (as used in technical contexts).

TOTAL: 45 PERIODS

PRACTICAL SESSIONS

UNIT- 1 6

Listening – Listening for general information and specific details; Listening conversation; Listening andfilling a passage (cloze listening). **Speaking** - Self Introduction; Introducing a friend; Conversation strategies; Telephone conversation. **Reading** – Reading different types of texts and brochures relevant to technical contexts

UNIT- 2 6

Listening - Listening to stories and event narration; documentaries and interviews with celebrities. **Speaking** - Narrating personal experiences and events; interviewing a celebrity; Reporting and summarizing of documentaries. **Reading** - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs.

UNIT- 3 6

Listening - Listening to a product and process descriptions; classroom lecture; and advertisements about a products. **Speaking** – Picture description; giving instruction to use a product and Present a product. **Reading** – Reading advertisements, gadget reviews; user manuals.

UNIT- 4 **6**

Listening – Listening to TED Talks; Scientific lectures; and educational videos. **Speaking** – Small Talk; Mini presentations and making recommendations. **Reading** – Newspaper articles; Journal reports – and Non Verbal Communication (tables, pie charts etc,.)

UNIT- 5 **6**

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. **Speaking** – group discussions, Debates, and Expressing opinions through Simulations & Role-play. **Reading** – Reading editorials and Opinion Blogs.

TOTAL: 30 PERIODS

LIST OF EXPERIMENTS:

1. Listening comprehension
2. Reading comprehension
3. English for every day conversation
4. Telephone conversation etiquettes
5. Self-Introduction strategies
6. Listening to stories
7. Narrating events/experiences
8. Listening to TED Talks/ Lectures
9. Mini Presentation/ Small Talks
10. Group Discussion/ Debates

LANGUAGE LAB SOFTWARE:

- Globarena

TOTAL: 75 PERIODS

COURSE OUTCOMES FOR THEORY:

At the end of the course, learners will be able

CO1: Frame questions, tags and one word substitutes, use correct tenses, write letters and emails
CO2: Use Concord, phrasal verbs, and write suitable and meaningful dialogues
CO3: Use imperatives, homonyms and homophones and write instructions and process descriptions.
CO4: Make notes, reports and recommendations and use articles, pronouns and collocations.
CO5: Write essays, use negations, degrees of adjectives, and cause and effect expressions.
CO6: Use LSRW Skills effectively in the required contexts of personal and professional life.

TEXT BOOKS:

1. English for Engineers & Technologists, Orient Blackswan Private Ltd., Department of English,Anna University, (2020 edition)
2. English for Science & Technology, Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By AyshaViswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	3	3	3	2	3	-	-
2	-	-	-	-	-	-	-	3	3	3	2	3	-	-
3	-	-	-	-	-	-	-	3	3	3	2	3	-	-
4	-	-	-	-	-	-	-	3	3	3	2	3	-	-
5	-	-	-	-	-	-	-	3	3	3	1	3	-	-
6	-	-	-	-	-	-	-	3	3	3	3	3	-	-
Low (1); Medium (2); High (3)														

MA2122 CALCULUS FOR ENGINEERS L T P C

3 1 0 4

COURSE OBJECTIVES:

1. To achieve conceptual understanding and to retain the best practices of traditional calculus.
2. To provide the basic ideas of calculus mainly for the purpose of modeling the engineering problems and obtaining solutions.
3. To mainly focus on topics such as matrix algebra, calculus of a single variable, multi-variable and differential equations plays an important role in the understanding of concepts in science and engineering.

UNIT- I MATRICES 12

Characteristic equation -Eigen values and Eigen vectors of a real matrix –Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem – Diagonalization of matrices by orthogonal transformation –Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms-Application Problems.

UNIT- II DIFFERENTIAL CALCULUS 12

Limit of a function(one sided limits, infinite limits, limits of trigonometric functions and limits with exponential and logarithmic functions) - Continuity-Types of discontinuity–Derivatives(Chain rule, Addition rule, multiplication rule, Division rule, implicit function, Parametric equations, Hyperbolic and its inverse) –Maxima and Minima of functions of one variable-concavity-points of inflection-Application Problems.

UNIT-III FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT- IV INTEGRAL CALCULUS 12

Definite and indefinite integrals-integration by substitution-integration using by parts formula-integration of trigonometric functions of products and powers-integration of irrational functions-Applications: Hydrostatic force and pressure, moments and centre of Mass.

UNIT- V ORDINARY DIFFERENTIAL EQUATIONS 12

Second order linear differential equations with constant coefficients-Method of variation of parameters-Cauchy and Legendre's linear equations-Simultaneous first order linear equations with constant coefficients-Application Problems.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: Applying matrix concepts to solve the problems for system of equations in engineering.
CO2: Apply the concept of functions, limit and continuity in solving the problems in engineering.
CO3: Employing the partial derivatives to find jacobians and maxima and minima of functions of two variables.
CO4: Utilizing the integration concepts to compute the various types of integrals.
CO5: Using the differential equations concepts to solve the problems occurred in engineering.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition,2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8,3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

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. Course material prepared by Department of Mathematics, PSNA College of Engineering and Technology, Dindigul-624622.
4. Web References: https://www.classcentral.com/course/swayam-engineering-mathematics-i-13000
5. Online resources: https://nptel.ac.in/courses

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	2	-	-	-	-	-	2	2	-	-
CO2	3	3	3	2	2	-	-	-	-	-	2	2	-	-
CO3	3	3	3	2	2	-	-	-	-	-	2	2	-	-
CO4	3	3	3	2	2	-	-	-	-	-	2	2	-	-
CO5	3	3	3	2	2	-	-	-	-	-	2	2	-	-
Low (1); Medium (2); High (3)														

PH2123 ENGINEERING PHYSICS L T P C

3 0 0 3

COURSE OBJECTIVES:

1. To make the students effectively to achieve an understanding of mechanics.
2. To enable the students to gain knowledge of electromagnetic waves and its applications.
3. To introduce the basics of oscillations, optics and lasers.
4. To equip the students to be successfully understand the importance of quantum physics.
5. To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS 9

Multi particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy. Moment of inertia: theorems of M .I – moment of inertia of continuous bodies: Thin uniform rod – M.I of a diatomic molecule - rotational dynamics of rigid bodies - torque – conservation of angular momentum – gyroscope - torsional pendulum.

UNIT II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum – Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - propagation of electromagnetic waves - polarization - Producing electromagnetic waves – Energy, momentum, intensity and Radiation pressure in EM waves (qualitative).

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance – waves on a string - standing waves - traveling waves - Energy transfer of a wave - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, semiconductor laser – Basic applications of lasers.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - Meaning of wave function - Particle in a infinite potential well: 1D – Normalization – Extension to 2D and 3D Boxes (qualitative).

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator (qualitative) - Barrier penetration and quantum tunneling(qualitative)- Scanning Tunneling microscope - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential – Basics of Kronig-Penney model and origin of energy bands: classification of materials based on energy bands.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Understand the importance of mechanics.
CO2: Express their knowledge in electromagnetic waves.
CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers
CO4: Understand the importance of quantum physics.
CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

REFERENCES:

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer- Verlag, 2012.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	-	2	-	-	-	-	-	-	-	1	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	2	2	-	-	2	-	-	-	1	-	-	-
CO4	3	-	3	-	-	-	2	-	-	-	-	-	-	-
CO5	3	3	-	2	-	-	-	-	-	-	-	1	-	-
Low (1); Medium (2); High (3)														

CY2124 ENGINEERING CHEMISTRY L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To inculcate sound understanding of water quality parameters and water treatment techniques.
2. To impart knowledge on the basic principles and preparatory methods of nano materials.
3. To introduce the basic concepts and applications of phase rule and composites.
4. To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
5. To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT- 1 WATER & ITS TREATMENT 9

Water: Sources and impurities, Water quality parameters: Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralisation and zeolite process.

UNIT- II NANO CHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT- III PHASE RULE & COMPOSITES 9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT- IV FUELS & COMBUSTION 9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method.

UNIT- V ENERGY SOURCES & STORAGE DEVICES 9

Stability of nucleus: mass defect, binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; Electric vehicles-working principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Super capacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3: To apply the knowledge of phase rule and composites for material selection requirements.
CO4: To recommend suitable fuels for engineering processes and applications.
CO5: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	-	3	3	1	-	-	-	2	-	-
2	3	3	2	2	-	3	3	1	-	-	-	2	-	-
3	2	3	2	2	-	3	2	1	-	-	-	2	-	-
4	3	3	2	2	-	3	3	1	-	-	-	2	-	-
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Low (1); Medium (2); High (3)														

GE2125 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

COURSE OBJECTIVES:

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

UNIT – I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT – II DATA TYPES, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT – III CONTROL FLOW, FUNCTIONS, STRINGS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT – IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT – V FILES, MODULES, PACKAGES 9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and loops for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
2. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.
3. Reema Thareja, “Python Programming using Problem Solving Approach”, First edition, Oxford University Press, 2017.

REFERENCES:

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

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	3	3	-	-	-	-	-	-	2	-	-
2	3	2	2	3	3	-	-	-	-	-	-	2	-	-
3	3	2	2	3	3	-	-	-	-	-	-	2	-	-
4	3	2	2	3	3	-	-	-	-	-	-	2	-	-
5	3	2	2	3	3	-	-	-	-	-	-	2	-	-
6	3	2	2	3	3	-	-	-	-	-	-	2	-	-
Low (1); Medium (2); High (3)														

GE2181 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

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

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On completion of the course, 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 and loops for solving problems.
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
2. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.
3. Reema Thareja,“Python Programming using Problem Solving Approach”, First edition, Oxford University Press, 2017.

REFERENCES:

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

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	3	3	-	-	-	3	-	1	2	-	-
2	3	2	2	3	3	-	-	-	3	-	1	2	-	-
3	3	2	2	3	3	-	-	-	3	-	1	2	-	-
4	3	2	2	3	3	-	-	-	3	-	1	2	-	-
5	3	2	2	3	3	-	-	-	3	-	1	2	-	-
6	3	2	2	3	3	-	-	-	3	-	1	2	-	-
Low (1); Medium (2); High (3)														

BS2182 **PHYSICS AND CHEMISTRY LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES:

1. To learn the proper use of various kinds of physics laboratory equipment.
2. To learn how data can be collected, presented and interpreted in a clear and concise manner.
3. To learn problem solving skills related to physics principles and interpretation of experimental data.
4. To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, chloride and copper.
5. To induce the students to familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

PHYSICS LABORATORY: (Any Six Experiments)

List of Experiments:

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
9. Post office box -Determination of Band gap of a semiconductor.
10. Photoelectric effect
11. Michelson Interferometer.
12. Melde's string experiment
13. Spectrometer Prism – Determination of refractive index.

TOTAL: 30 PERIODS

Equipment required:

1. Travelling Microscope
2. Semiconducting laser
3. Melde's string apparatus
4. Michelson Interferometer
5. Ultrasonic interferometer.
6. Cantilever
7. Spectrometer
8. Torsion Pendulum

CHEMISTRY LABORATORY: (Any six experiments)

List of Experiments:

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.
2. Determination of types and amount of alkalinity in water sample.
   – Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitationtitration).
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using flame photometer.

TOTAL: 30 PERIODS

Equipment required:

1. Digital Conductivity meter
2. Digital Potentiometer
3. Digital pH meter
4. Flame photometer

COURSE OUTCOMES:

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

CO1: Understand the functioning of various physics laboratory equipment.
CO2: Use graphical models to analyze laboratory data.
CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.
CO4: To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
CO5: To quantitatively analyse the impurities in solution by electroanalytical techniques

TEXT BOOK:

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbookof Quantitative Chemical Analysis (2009).

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	2	2	-	-	3	-	-	2	-	-
2	3	3	3	2	2	2	-	-	3	-	-	2	-	-
3	3	3	3	2	2	2	-	-	3	-	-	2	-	-
4	3	3	3	2	2	3	3	2	3	-	-	2	-	-
5	3	3	3	2	2	3	2	1	3	-	-	2	-	-
Low (1); Medium (2); High (3)														

HS2221 COMMUNICATIVE ENGLISH L T P C

2 0 0 2

COURSE OBJECTIVES:

1. To engage learners in meaningful language activities to improve their LSRW skills
2. To enhance learners' awareness of general rules of writing for specific audiences
3. To help learners understand the purpose, audience, contexts of different types of writing
4. To develop analytical thinking skills for problem solving in communicative contexts
5. To demonstrate an understanding of job applications and interviews for internship and placements

UNIT - I MAKING COMPARISONS **6**

Reading - Reading advertisements, user manuals, and brochures; **Writing** – Proposal Writing, Itinerary; **Grammar** – Articles, Compound Words; **Vocabulary** – Contextual meaning of words

UNIT - II EXPRESSING CAUSAL RELATIONS IN WRITING **6**

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, **Writing** - Writing responses to complaints. **Grammar** - Active Passive Voice transformations, Infinitive and Gerunds; **Vocabulary** –Adverbs, Purpose and Expressions.

UNIT - III PROBLEM SOLVING **6**

Reading - Case Studies, excerpts from literary texts, news reports etc., **Writing** – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. **Grammar** – Error correction; If conditional sentences; **Vocabulary** - Compound Words.

UNIT- IV REPORTING OF EVENTS AND RESEARCH **6**

Reading –Newspaper articles; **Writing** – Recommendations, Accident Report, Survey Report -**Grammar** –Modals- **Vocabulary** – Conjunctions.

UNIT- V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY **6**

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; **Writing** – Job / Internship application – Cover letter & Resume; **Grammar** – Numerical adjectives, **Vocabulary** – Idioms.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able

CO1: Use contextual meaning of words and construct grammatically correct sentences.
CO2: Apply cause and effect structures in the technical texts and write perfect emails.
CO3: Write formal and informal letters, Checklists and Argumentative Essays.
CO4: Read and comprehend articles and write reports and recommendations.
CO5: Draft effective resume and cover letter in context of job search.
CO6: Use the English language both for technical and functional situations.

TEXT BOOKS :

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.Authored by Dr.VeenaSelvam, Dr.SujathaPriyadarshini, Dr.Deepa Mary Francis, Dr. KN. Shoba, andDr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	3	3	3	2	3	-	-
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3	-	-	-	-	-	-	-	3	3	3	2	3	-	-
4	-	-	-	-	-	-	-	3	3	3	2	3	-	-
5	-	-	-	-	-	-	-	3	3	3	3	3	-	-
6	-	-	-	-	-	-	-	3	3	3	3	3	-	-
Low (1); Medium (2); High (3)														

(Common to Civil, Mech and EEE)

MA2221 INTEGRALS AND COMPLEX FUNCTIONS L T P C

3 1 0 4

COURSE OBJECTIVES:

1. To provide the idea of calculating area and volume involving ordinary and vector functions using integrals.
2. To cater the needs of techniques to solve the problems occurring in fluid dynamics, electro-magnetic field theory and structural analysis.
3. To solve integrals involving complex functions and also to solve the differentialequations using Laplace transform techniques.

UNIT – I MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in Cartesian and polar coordinates - Areaenclosedbyplanecurves–Tripleintegrals–Volumeofsolidsincartesiancoordinates– Applications: Moments and centres of mass, moment of inertia.

UNIT-II VECTOR CALCULUS 12

Gradient and directional derivative–Divergence and curl, irrotational and solenoidal vector fields– line, surface and volume integral - Green's theorem in a plane, Gauss's divergence theorem and Stoke's theorem (excluding proofs) verification and applications in evaluating line, surface and volume integrals.

UNIT –III ANALYTIC FUNCTIONS 12

Analytic functions-necessary and Sufficient conditions for analyticity in Cartesian and polar coordinates- properties -Harmonic conjugates - Construction of analytic functions - Conformal mapping: $w = z+c, cz, 1/z, z^2$ and Bilinear transformation.

UNIT – IV COMPLEX INTEGRATION 12

Cauchy's integral theorem- Cauchy's integral formula - Taylor's and Laurent's series expansion – Singularities –Types of Residues - Cauchy's Residue theorem- evaluation of real definite integrals as contour integrals around unit circle and semi - circle (poles on the real axis excluded).

UNIT- V LAPLACE TRANSFORMS 12

Sufficient condition for existence of Laplace Transform – Transform of elementary functions – Transforms of unit step and unit impulse functions – Basic properties – Shifting Theorems – Transforms of derivatives- periodic functions – Initial and final value theorems – Inverse transforms– Convolution theorem – partial fraction method –Laplace transform technique for solving linear second order ordinary differential equations and simultaneous first order linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On Completion of the course, students will exhibit their ability in the following:

CO1: Apply multiple integrals techniques to evaluate area and volume.
CO2: Solve engineering problems using the concepts of vector calculus.
CO3: Construct an analytic function, when its real or imaginary part is known.
CO4: Evaluating integrals using Cauchy's integral formula and residue theorem.
CO5: Apply Laplace Transform techniques to solve ordinary differential equations.

TEXT BOOKS:

1. Grewal.B.S, "Higher Engineering Mathematics", Khanna Publications, New Delhi, 44th edition, 2017.
2. Jain R.K. and Iyengar, S.R.K,"Advanced Engineering Mathematics",NarosaPublications,New Delhi,4th Edition,2014

REFERENCES:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 7thedition,Laxmi Publications (P) Ltd., Reprint 2010.
2. Reading material prepared by Department of Mathematics, PSNA College of Engineeringand Technology, Dindigul – 624 622.
3. Ramana B.V,"Higher Engineering Mathematics",TataMcGraw Hill Publishing Company, New Delhi,11thReprint,2010.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Pvt. Ltd, 9th Edition Singapore 2006,Reprint 2013.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	2	-	-	-	-	-	-	2	-	-
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3	3	3	3	2	2	-	-	-	-	-	-	2	-	-
4	3	3	3	2	2	-	-	-	-	-	-	2	-	-
5	3	3	3	2	2	-	-	-	-	-	-	2	-	-
Low (1); Medium (2); High (3)														

PH2212 PHYSICS FOR MECHANICAL ENGINEERING L T P C

3 0 0 3

COURSE OBJECTIVES:

1. To make the students to understand the basics of crystallography and its importance in studying materials properties.
2. To understand the electrical properties of materials including free electrontheory, applications of quantum mechanics and magnetic materials.
3. To instill knowledge on physics of semiconductors, determination of charge carriers and device applications
4. To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
5. To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

UNIT – I CRYSTALLOGRAPHY 9

Crystalline and Non-crystalline materials – Unit cell characteristics - Crystal systems and Bravis lattice (qualitative) – Atomic radius and Packing factor: SC, BCC, FCC and HCP– Planes in crystal -Miller indices – linear and planar densities (qualitative)–Crystal imperfections: edge and screw dislocations–grain and twin boundaries-Burgers vector.

UNIT – II ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS 9

Classical free electron theory-Expression for electrical conductivity–Thermal conductivity – Wiedemann Franz law-Quantum free electron theory –Fermi-Dirac statistics – Density of energy states – Magnetic materials: Dia, para and ferro magnetic effects–exchange interaction in ferromagnetism–MR effect and GMR sensor.

UNIT – III SEMICONDUCTORS AND TRANSPORT PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors–extrinsic semiconductors-Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature and impurity – Carrier transport in Semiconductors: Drift, mobility and diffusion–Hall effect theory and experiment – Ohmic contacts – Schottky diode.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, Optical processes in quantum wells – Optoelectronic devices: light detectors and solar cells – light emitting diode –laser diode - optical processes in organic semiconductor devices (OLED).

UNIT V NANO ELECTRONIC DEVICES 9

Quantum confinement – Quantum structures – quantum wells, wires and dots – Resonant tunneling – Resonant tunneling diode - Mesoscopic structures – Single electron phenomena – Single electron Transistor – spintronics –Carbon nanotubes: Properties and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Students will be able

CO1: To understand the basics of crystallography and its importance in studying materials properties.

CO2: To understand the electrical properties of materials including free electron theory applications of quantum mechanics and magnetic materials.

CO3: To acquire knowledge on physics of semiconductors, determination of charge carriers and device applications.

CO4: To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications.

CO5: To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

TEXT BOOKS:

1. V.Raghavan. Materials Science and Engineering: A First Course, Prentice Hall India Learning Private Limited, 2015.
2. S.O. Kasap, Principles of Electronic Materials and Devices, Mc-Graw Hill, 2018.
3. Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley (India), 2007.
4. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, Mc-Graw Hill India ,2019
5. G.W.Hanson. Fundamentals of Nanoelectronics.Pearson Education (Indian Edition), 2009.

REFERENCES:

1. R.Balasubramaniam, Callister's Materials Science and Engineering. Wiley (Indian Edition), 2014.
2. Wendelin Wright and Donald Askeland, Essentials of Materials Science and Engineering, CL Engineering, 2013.
3. Robert F.Pierret, Semiconductor Device Fundamentals, Pearson, 2006
4. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Pearson, 2017
5. Ben Rogers, Jesse Adams and SumitaPennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2017.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	3	-	-	1	-	-	-	-	-	-	-
2	3	-	-	-	2	-	2	-	-	-	-	3	-	-
3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
4	3	-	-	2	-	3	2	-	-	-	-	-	-	-
5	-	3	-	3	-	-	3	-	3	-	-	-	-	-
Low (1); Medium (2); High (3)														

GE2221	ENGINEERING GRAPHICS	L	T	P	C
		2	0	4	4

COURSE OBJECTIVES:

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

1. Drawing engineering curves and orthographic projection of Points, Lines
2. Drawing orthographic projection of Planes and freehand sketch of simple objects.
3. Drawing orthographic projection of solids.
4. Drawing section of solids and development of surfaces
5. Drawing isometric and perspective projections of simple solids.
6. Enhancing the imagination capacity of the students.

CONCEPTS AND CONVENTIONS (Not for Examination)

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, PROJECTION OF POINTS AND LINES 6+12

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

UNIT-II PROJECTION OF PLANE SURFACE AND FREEHAND SKETCHING 6+12

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles - Representation of Three Dimensional objects - Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT-III PROJECTION OF SOLIDS 6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT- IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+12

Sectioning of above solids 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. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT-V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection - isometric scale -isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL: 90 PERIODS

COURSE OUTCOMES:

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

CO1: Use BIS conventions and specifications for engineering drawing; Construct the conic curves, involutes, cycloid, and Draw the projection of points, lines.
CO2: Solve practical problems involving projection of Planes and Free Hand Sketching.
CO3: Solve practical problems involving projection of Solids
CO4: Draw the section of Solids and Development of simple solids.
CO5: Draw the orthographic, isometric and perspective projections of simple solids.
CO6: Apply the concepts of drawing in Practical applications

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES:

1. BasantAgarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore,27thEdition, 2017.
3. 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.
4. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
5. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation —Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	-	2	-	-	2	-	2	-	2	2	2
2	3	3	-	-	2	-	-	2	-	2	-	2	2	2
3	3	3	-	-	2	-	-	2	-	2	-	2	2	2
4	3	3	-	-	2	-	-	2	-	2	-	2	2	2
5	3	3	-	-	2	-	-	2	-	2	-	2	2	2
6	3	3	-	-	2	-	-	2	-	2	-	2	2	2
Low (1); Medium (2); High (3)														

EC2214 FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To introduce the basics of electric circuits and analysis
2. To impart knowledge in the basics of working principles and application of electrical machines
3. To introduce analog devices and their characteristics
4. To educate on the fundamental concepts of digital electronics
5. To introduce the functional elements and working of measuring instruments

UNIT- I ELECTRICAL CIRCUITS 9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) star to delta and delta to star transformation.

UNIT- II ELECTRICAL MACHINES 9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications.Construction, Working principle and Applications of Transformer, Single Phase Induction Motor.

UNIT- III ANALOG ELECTRONICS 9

Introduction to semiconductors - PN junction diode, zener diode and its characteristics – Half wave and full wave rectifiers, Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics – Power conditioning Equipments: Linear mode power supply, SMPS and UPS -Display devices: LED and LCD.

UNIT- IV DIGITAL ELECTRONICS 9

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only)

UNIT- V MEASUREMENTS AND INSTRUMENTATION 9

Functional elements of an instrument, Standards and calibration, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Classification of transducer, Capacitive transducer – inductive transducer - LVDT - Hall effect - Piezoelectric transducer.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able

CO1: To understand the concept of basics of electric circuits and analysis.
CO2: To discuss about the basics of working principles and application of electrical machines.
CO3: To introduce the basic concept of analog devices and their characteristics.
CO4: To discuss the fundamental concepts of digital electronics.
CO5: To understand the functional elements and working of measuring instruments.

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, PuneetSawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', DhanpatRai and Co, 2015.

REFERENCES:

1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
3. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
4. MahmoodNahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	2	1	-	-	-	-	-	1	-	-
2	3	2	2	3	2	1	-	-	-	-	-	1	-	-
3	3	3	3	2	1	2	-	-	-	-	-	1	-	-
4	3	3	2	3	2	1	-	-	-	-	-	1	-	-
5	3	2	3	2	2	1	-	-	-	-	-	1	-	-
Low (1); Medium (2); High (3)														

GE2281 ENGINEERING PRACTICES LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

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 common household wood work.
2. 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's; Making a tray out of metal sheet using sheet metal work.
3. Basic Wiring connections like residential house wiring, fluorescent lamp wiring and staircase wiring.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & MECHANICAL)

PART- I CIVIL ENGINEERING PRACTICES **6**

Plumbing Work:

a) Connecting various basic pipe fittings like valve, tap, coupling, union, reducer, elbow and other components which are commonly used in household.
b) Preparing plumbing line sketches for fixing various household things like wash basin, pump etc.

Wood Work:

a) Basic Operations
b) Preparing T-Joint, Mortise joint and Tenon joint and Dovetail joint.
c). Preparing a pen/Mobile stand

PART-II MECHANICAL ENGINEERING PRACTICES **15**

Welding Work:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

Basic Machining Work:

a) Simple Operations (Facing/Turning/Step turning/Chamfering)
b) Taper Turning and knurling
c) Drilling and Tapping

Sheet Metal Work:

a) Making of a square tray
b) Making of Funnel

Demonstration:

a) Demonstrating basic foundry operations
b) Thread cutting demo using lathe
c) Studying common industrial trusses using models.
d) Assembling a centrifugal pump.
e) Assembling an air conditioner.

PART- III GREEN TECHNOLOGY 3

a) An overview of parts in E-Vehicle (Fourwheeler)

b) Assembling of e-vehicle (Two Wheeler)

c) Solar based electric fan assembly.

PART- IV PLANT VISIT 6

a) A visit to Renewable Energy Sources

GROUP–B (ELECTRICAL & ELECTRONICS)

PART- V ELECTRICAL ENGINEERINGPRACTICES 15

a) Residential house wiring using switches, fuse, indicator, lamp and energy meter
b) Fluorescent Lamp Wiring with introduction to CFL and LED types.
c) Stair case wiring - Single Lamp controlled by two switches.
d) Measurement of energy using single phase energy meter.
e) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/Quadrac)

PART- VI ELECTRONIC ENGINEERING PRACTICES 15

a) Study of Electronic components and equipment:
i) Resistor color coding
ii) Measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
b) Study of logic gates: AND, OR, NOT, EX-OR, NAND and NOR
c) Verification of Ohm's Law and Kirchhoff's Law
d) Soldering practice – Components Devices and Circuits – Using general purpose PCB.
e) Study of Arduino UNO
f) Troubleshooting and Installation of OS in Computer/Laptop

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Able to understand the basics of Plumbing and carpentry works
CO2: Apprehend the basic fabrication process like welding and sheet metal operations
CO3: Understanding the machining operations-Turning/Facing/Step turning, Chamfering & Knur
CO4: Study about different types of Electrical wiring and analyze basic parameters of Electrical circuits
CO5: Study basic electronic components and equipment's and acquire knowledge in PCB fabrication and Soldering.
CO6: Study the features of Arduino UNO and Installation of OS

REFERENCES:

1. 1.K.Jeyachandran, S.Natarajan& S, Balasubramanian, "A Primer of Engineering Practices Laboratory",Anuradha Publications, (2007).
2. 2.T.Jeyapoovan, M.Saravanapandian&S.Pranitha, "Engineering Practices Lab Manual", Vikas PublishingHouse Pvt.Ltd, (2006)
3. 3.H.S. Bawa, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, (2007).

LIST OF EQUIPMENTS

GROUP – A (CIVIL & MECHANICAL)

SL.NO	NAME OF THE EQUIPMENT'S	No'S
1	Centre Lathe	9
2	Drilling Machine	1
3	Welding Machines	5
4	Carpentry Tools	15 Set
5	Sheet Metal Tools	15 Set
6	Electric Two Wheeler	1
7	Electric Four Wheeler	1
8	Centrifugal Pump model	1
9	Split AC model	1
10	Solar based Fan Kit	1
11	Truss Model	1 Set
12	Foundry Equipment's	2 Set

GROUP – B (ELECTRICAL & ELECTRONICS)

Sl.No	Name of the Equipment's	No's
1	Residential House Wiring Setup	2
2	Fluorescent Lamp Wiring Setup	2
3	Staircase Wiring Setup	2
4	Energy meter wiring	2
5	Resistive Load	4
6	Fan Regulator	2
7	Resistors	50
8	CRO	10
9	Logic Gates IC's	30
10	Soldering Kit	10
11	Arduino Kit	10
12	Computer/Laptop	2

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	1	2	-	-	-	-	-	2	2	3	2
2	3	2	2	2	2	-	-	-	-	-	2	2	3	2
3	3	2	2	2	3	-	-	-	-	-	2	2	3	2
4	3	2	2	2	3	-	-	-	-	-	2	2	3	2
5	3	3	3	3	3	-	-	-	-	-	2	2	3	2
6	3	3	3	3	3	-	-	-	-	-	2	2	3	2
Low (1); Medium (2); High (3)														

EC2281 FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY L T P C

0 0 3 1.5

COURSE OBJECTIVES

1. To train the students in conducting load tests on electrical machines.
2. To gain practical experience in characterizing electronic devices.
3. To train the students to use LVDT for measurements.

LIST OF EXPERIMENTS

1. Verification of ohms and Kirchhoff's Laws.
2. Load test on DC Shunt Motor.
3. Load test on Self Excited DC Generator.
4. Load test on Single phase Transformer.
5. Load Test on Induction Motor.
6. Characteristics of PN and Zener Diodes.
7. Characteristics of BJT.
8. Half wave and Full Wave rectifiers
9. Study of Logic Gates.
10. Verification of Boolean expression using Logic Gates.
11. Measurement using LVDT.

COURSE OUTCOMES:

On successful completion of this course, the student will be able

CO1: Use experimental methods to verify the Ohm's and Kirchhoff's Laws.
CO2: Analyze experimentally the load characteristics of electrical machines.
CO3: Analyze the characteristics of basic electronic devices.
CO4: Use experimentally the Boolean expression.
CO5: Use experimentally the measuring instruments

LIST OF EQUIPMENTS

Sl.No	Name of the Equipment's	No's
1	RPS (regulated power supply) (0-30V)	20
2	330Ω , 10kΩ, 1kΩ, 220ΩResistance	50each
3	Ammeter (0-30mA)MC& (0-500)µA MC , (0–250) µA MC	20Each
4	Voltmeter (0-30V)MC& Voltmeter (0–1)V &(0-10V)MC	20each
5	Bread Board & Wires	10
6	Voltmeter (0-150)V MI& MC,& (0-300) V MI &MC	20E
7	Ammeter (0-10)A MI, &(0-20) A MI	20E
8	Wattmeter 150V,20A , UPF**&**300V,10A UPF	12E
9	Auto transformer 240 V, 2.7 KVA,10A	4E
10	Diode IN4001	30
11	Zener diode FZ5.1	30
12	Transistor BC 107	30
13	Transformer 230/(6-0-6)V	10
14	Capacitor 100µf	30
15	CRO 1Hz20MHz	4
16	LVDT	4
17	Digital displacement indicator	4
18	Calibration jig (with micrometre)	4
19	Logic trainer kit	10
20	logic gates / ICs IC 7408, IC 7432, IC 7404, IC 7400, IC 7402, IC 7486,IC74266	30Each
21	DC Shunt Motor 220V,10A	4
22	Self Excited DC Generator 220V,10A	4
23	Induction Motor 240V ,5A	4
24	Single phase Transformer 230v/230v 2.5KVA,10.8A	4
25	Rheostat 50Ω,400Ω	8Each
26.	Tachometer	5

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	-	-	-	-	-	-	2	3	-	-	-	-
2	3	3	2	3	-	-	-	-	3	2	-	-	-	-
3	3	3	-	3	-	-	-	-	3	2	-	-	-	-
4	3	2	-	3	-	-	-	-	3	2	-	-	-	-
5	3	3	2	2	-	-	-	-	2	3	-	-	-	-
Low (1); Medium (2); High (3)														

HS2281 COMMUNICATION AND SOFT SKILLS LABORATORY L T P C

0 0 3 1.5

COURSE OBJECTIVES:

1. To enhance the employability and career skills of students.
2. To orient the students and groom them as professionals.
3. To make them employable graduates.
4. To develop their confidence and help them attend interviews successfully.

UNIT -I **9**

Elements of Communication – barriers of communication - verbal and nonverbal communication - 7C's of communication- Conversation skills- Listening for information - Speak with correct pronunciation - Reading for information - Writing Paragraphs – essays – letters – resume - reports.

UNIT -II **9**

Self-introduction - organizing the material – Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice – presenting the visuals effectively

UNIT-III **9**

Introduction to Group Discussion - Participating in group discussions – understanding group dynamics – brain storming the topic – questioning and clarifying – GD strategies - activities to improve GD skills

UNIT -IV **9**

Interview etiquette – dress code – body language – attending job interviews – telephonic interview - one to one interview & panel interview – FAQs related to job interviews

UNIT -V **9**

Introduction to Soft Skills – hard skills & soft skills – employability and career skills - Grooming as a professional with values - Time &Stress Management, Leadership Skills, Decision Making Skills, Creative Thinking, and Problem Solving Skills

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

1. Self-Introduction
2. Presentation Skills
3. Group Discussion & Conversation Skills
4. Interview Skills
5. Cover Letter and Resume
6. Report Writing
7. Time &Stress Management Techniques
8. Leadership Traits
9. Creative Thinking Skills and Problem Solving Skills
10. English for Competitive Exams

LANGUAGE LAB SOFTWARE:

- Globarena

COURSE OUTCOMES:

After completion of the course, students are able to have the proficiency in the following:

CO1: Apply the strategies of effective communication and use LSRW skills productively.

CO2: Give an effective self-introduction, present on topics with effective visual aids and answerquestions effectively in the query sessions.

CO3: Identify the etiquettes of participating in a group discussion and execute them in real timediscussions during the placement drives.

CO4: Illustrate the different types of interviews and master the etiquettes of interview skills andapply them effectively in job interviews.

CO5: Distinguish hard and soft skills, achieve mastery in the etiquettes of those skills and apply themin social and professional environment.

CO6: Identify the procedures of taking part in competitive exams like IELTS, TOEFL with reference tolistening, speaking, reading and writing skills.

TEXT BOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.
3. Interact English Lab Manual for Undergraduate Students,. Orient Balckswan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	2	-	-	-	-	-	3	3	3	3	3	-	-
2	-	-	-	-	-	-	-	3	3	3	3	3	-	-
3	-	-	-	-	-	-	-	3	3	3	3	3	-	-
4	-	-	-	-	-	-	-	3	3	3	-	3	-	-
5	-	-	-	-	-	-	-	3	3	3	3	3	-	-
6	-	-	-	-	-	2	-	3	3	3	-	2	-	-
Low (1); Medium (2); High (3)														

PSNA College of Engineering and Technology

(An Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai)

Dindigul – 624 622.

Estd : 1984

B.E: MECHANICAL ENGINEERING

Syllabus of III and IV semesters for Regulations 2022

(Choice Based Credit System)

For the Students admitted in the Academic year 2022-23 onwards

February 2023

PSNA College of Engineering and Technology, Dindigul – 624 622

(An Autonomous Institution Affiliated to Anna University, Chennai)

SECOND MEETING OF THE ACADEMIC COUNCIL

28th April 2023

Regulations R 2022

B.E., Mechanical Engineering

Approved copy of syllabus (3 and 4 semesters)

Sl. No	Name and Affiliation	Signature
Chairman		
1.	**Dr. D. Vasudevan,** Principal and Chairman of Academic Council, PSNACET.	
Registrar		
2.	**Dr. C. Jayaguru,** Registrar – Academic, PSNACET.	
Chairman –Board of Studies		
3.	**Dr.R.Kannan,** Professor and Head, Department of Mechanical Engineering, PSNACET.	

MA2324 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 1 0 4

COURSE OBJECTIVES:

1. To study the formation and solve the Partial Differential Equations.
2. To understand the concepts of Dirichelt's conditions and Fourier series.
3. To solve the boundary value problems by using Fourier series.
4. To Study the application of transform techniques using Fourier Transforms.
5. To provide the basic concepts of Z-Transform and solve the difference equations.

UNIT- I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations - Elimination of arbitrary constants and functions – Solutions of five standard types of first order partial differential equations - Lagrange's linear equation - Homogenous type of Second order Linear differential equations with constant coeffiecients.

UNIT-II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series –Half range sine and cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT-III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE –Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT-IV FOURIER TRANSFORMS 12

Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT-V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties–Inverse Z-transform (using partial fraction and residues) - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

COURSE OUTCOMES

After completion of the course, students are able to have the proficiency in the following:

CO1: To describe real time Engineering problems using PDEs.
CO2: To design general periodic functions and apply in problems of Fourier series, which are sums of sines and cosines.
CO3: To describe real time engineering problems using PDE in 1-D wave vibrating membrane and heat passing through rod, two dimensional heat conduction problems.
CO4: To use the Fourier transform as the tool to connect the time domain and frequency domain in signal processing.
CO5: To use the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z - Transform techniques for discrete time systems.

TEXT BOOKS:

1.Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint,2012.
2.Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
3.Narayanan S., Manicavachagam Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd.1998.
4.Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi,2008.

REFERENCES:

1. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd,2007.
2.Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
3.Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India,2007.
4.Ray Wylie C and Barrett.L.C, "Advanced Engineering Mathematics"Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi,2012.
5.Datta K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi,2013.
6.Online resources: https://nptel.ac.in/courses

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	-	1	-	-	-	-	-	-	-	-	-
2	2	2	2	1	-	-	-	-	-	-	-	-	1	-
3	3	1	2	-	1	-	-	-	-	-	-	-	-	1
4	2	2	2	1	-	-	-	-	-	-	-	-	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	-	-
Low (1); Medium (2); High (3)														

ME2311 ENGINEERING MECHANICS L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures
2. To introduce the equilibrium of rigid bodies, vector methods and free body diagram
3. To study and understand the properties of surfaces and solids.
4. To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. To develop basic dynamics concepts – force, momentum, work an d energy.

UNIT I STATICS OF PARTICLES 9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES 9

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Distributed Loads on Beams, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9

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

UNIT IV FRICTION 9

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction, Belt friction.

UNIT V DYNAMICS OF PARTICLES 9

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion-Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Illustrate the vector and scalar representation of forces and moments.
CO2: Analyse the rigid body in equilibrium.
CO3: Evaluate the properties of surfaces and solids.
CO4: Determine the friction and the effects by the laws of friction.
CO5: Calculate dynamic forces exerted in rigid body.

TEXT BOOKS:

1 Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12thEdition, 2019.
2 Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES:

1 Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2 Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3 Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.
4 Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5 Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	1	1	-	-	-	-	-	-	3	1	1
2	3	3	2	1	1	-	-	-	-	-	-	3	3	1
3	3	3	3	1	1	-	-	-	-	-	-	3	3	1
4	3	3	3	1	1	-	-	-	-	-	-	3	3	1
5	3	3	3	1	1	-	-	-	-	-	-	3	3	1
Low (1); Medium (2); High (3)														

ME2312 ENGINEERING THERMODYNAMICS L T P C

3 0 0 3

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 analysing the performance of thermal devices.
3. Impart knowledge on availability and applications of second law of thermodynamics
4. Teach the various properties of steam through steam tables and Mollier chart.
5. Impart knowledge on thermodynamic relations of ideal, real gases and psychometric processes.

UNIT I BASICS, ZEROTH AND FIRST LAW 9

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 and unsteady flow processes.

UNIT II SECOND LAW AND ENTROPY 9

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.

UNIT III AVAILABILITY AND APPLICATIONS OF II LAW 9

Ideal gases undergoing different processes - principle of increase in entropy. Applications of II Law. High- and low-grade energy. Availability and Irreversibility for open and closed system processes - I and II law Efficiency

UNIT IV PROPERTIES OF PURE SUBSTANCES 9

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 V THERMODYNAMIC RELATIONS AND PSYCHROMETRY 9

Maxwell relations - TdS Equations - heat capacities relations - Energy equation, Joule- Thomson experiment - Clausius-Clapeyron equation. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Apply the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.

CO2: Apply the second law of thermodynamics in analysing the performance of thermal devices through energy and entropy calculations.

CO3: Apply the second law of thermodynamics in evaluating the various properties of steam through steam tables and Mollier chart

CO4: Apply the properties of pure substance in computing the macroscopic properties of ideal and real gases using gas laws and appropriate thermodynamic relations.

CO5: Derive simple thermodynamic relations of ideal and real gases and calculate the properties of moist air with its use in psychometric processes.

TEXT BOOKS:

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

REFERENCES:

1. Cengel, Y and M. Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill,9th Edition, 2019.
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", 10th Edition, Wiley Eastern, 2019.
5. Venkatesh. A, "Basic Engineering Thermodynamics", Universities Press (India) Limited, 2007

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	1	-		-	-	-	-	-	2	-	-
2	3	3	2	1	-		-	-	-	-	-	2	-	-
3	3	3	2	1	-		-	-	1	-	1	2	1	-
4	3	3	2	1	-	1	-	-	2	-	1	2	1	1
5	3	3	2	1	-	1	-	-	2	-	1	2	1	1
Low (1) ; Medium (2) ; High (3)														

ME2313 FLUID MECHANICS AND MACHINERY L T P C
3 1 0 4

COURSE OBJECTIVES:

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 and boundary layer concept.
3. To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends.
4. To exposure to the significance of boundary layer theory and its thicknesses.
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 PROPERTIES AND FLOW CHARACTERISTICS 10+3

Properties of fluids – Fluid statics - Pressure Measurements - Buoyancy and floatation - Flow characteristics - Eulerian and Lagrangian approach - Concept of control volume and system - Reynold's transportation theorem - Continuity equation, energy equation and momentum equation - Applications.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9+3

Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 8+3

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

UNIT IV TURBINES 9+3

Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.

UNIT V PUMPS 9+3

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.

TOTAL: 60 PERIODS

COURSE OUTCOMES

On completion of the course, the student is expected to be able to

1. **CO1:** Understand the properties and behaviour in static conditions. Also, to understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.
2. **CO2:** Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel. Also, to understand the concept of boundary layer and its thickness on the flat solid surface.
3. **CO3:** Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies
4. **CO4:** Explain the working principles of various turbines and design the various types of turbines.
5. **CO5:** Explain the working principles of centrifugal, reciprocating and rotary pumps and design the centrifugal and reciprocating pumps.

TEXT BOOKS:

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

REFERENCES:

1 Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2011.
2 Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016.
3 Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014.
4 S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.
5 Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co., 2010.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2	-	-	-	-	-	1	1	2	2	1
2	3	3	3	2	-	-	-	-	-	1	1	2	2	1
3	3	3	3	3	-	-	-	-	-	1	1	2	2	1
4	3	3	3	3	-	-	-	-	-	1	1	3	2	1
5	3	3	3	3	-	-	-	-	-	1	1	3	2	1
Low (1) ; Medium (2) ; High (3)														

ME2314 ENGINEERING MATERIALS AND METALLURGY L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To learn the constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.
2. To learn selecting and applying various heat treatment processes and its microstructure formation.
3. To illustrate the different types of ferrous and non-ferrous alloys and their uses in engineering field.
4. To illustrate the different polymer, ceramics and composites and their uses in engineering field.
5. To learn 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 – Austempering, Martempering – Hardenability, Jominy end quench test -case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and induction hardening – Vacuum and Plasma hardening – Thermo-mechanical treatments- elementary ideas on sintering.

UNIT III FERROUS AND NON-FERROUS METALS 9

Effect of alloying additions on steel (Mn, Si, Cr, Mo, Ni, V,Ti& W) – 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 – Titanium alloys, Mg-alloys, Ni-based super alloys – shape memory alloys- Properties and Applications- overview of materials standards

UNIT IV NON-METALLIC MATERIALS 9

Polymers – types of polymers, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PAI, PPO, PPS, PEEK, PTFE, Thermoset polymers – Urea and Phenol formaldehydes –Nylon, Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON – intermetallics Composites- Matrix and reinforcement Materials- applications of Composites – Nano composites.

UNIT V DEFORMATION MECHANISMS AND MECHANICAL PROPERTIES 9

Mechanisms of plastic deformation, slip and twinning – Types of fracture – fracture mechanics- Griffith's theory- Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test Izod and charpy, fatigue and creep failure mechanisms.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.
CO2: Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.
CO3: Clarify the effect of alloying elements on ferrous and non-ferrous metals.
CO4: Summarize the properties and applications of non-metallic materials.
CO5: Explain the testing of mechanical properties.

TEXT BOOKS:

1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th edition ,2018.
2. Sydney H.Avner, "Introduction to Physical Metallurgy", McGraw Hill Book Company, 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, 2020.
4. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt.Ltd. 6th edition, 2019.
5. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, 2nd edition Re print 2019.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	1	-	-	-	-	-	-	-	2	2	1
2	3	1	2	1	-	2	-	1	-	-	-	2	2	1
3	3	1	1	-	-	-	1	-	-	-	-	2	2	1
4	3	1	2	-	-	-	1	-	-	-	-	2	2	1
5	3	1	2	2	1	1	-	-	-	-	-	2	2	1
Low (1) ; Medium (2) ; High (3)														

ME2315 MANUFACTURING PROCESSES L T P C

3 0 0 3

COURSE OBJECTIVES:

1. To illustrate the working principles of various metal casting processes.
2. To analyse the working principles of bulk deformation of metals.
3. To learn and apply the working principles of various metal joining processes.
4. To learn the working principles of sheet metal forming process.
5. To study and practice the working principles of plastics molding.

UNIT – I METAL CASTING PROCESSES 9

Sand Casting – Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Molding sand Properties and testing – Cores –Types and applications – Molding machines – Types and applications– Melting furnaces – Principle of special casting processes- Shell, investment – Ceramic mould – Pressure die casting – low pressure, gravity- Tilt pouring, high pressure die casting- Centrifugal Casting – CO2 casting –- Defects in Sand casting process-remedies

UNIT II BULK DEFORMATION PROCESSES 9

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – cold forging- Characteristics of the processes – Typical forging operations – rolling of metals – Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts – Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion. Introduction to shaping operations.

UNIT III METAL JOINING PROCESSES 9

Fusion welding processes – Oxy fuel welding – Filler and Flux materials-–Arc welding, Electrodes, Coating and specifications – Gas Tungsten arc welding –Gas metal arc welding - Submerged arc welding – Electro slag welding– Plasma arc welding –– Resistance welding Processes -Electron beam welding –Laser beam Welding Friction welding – Friction stir welding – Diffusion welding – Thermit Welding, Weld defects – inspection &remedies – Brazing - soldering – Adhesive bonding.

UNIT IV SHEET METAL PROCESSES 9

Sheet metal characteristics – Typical shearing, bending and drawing operations – Stretch forming operations Formability of sheet metal – Test methods –special forming processes - Working principle and applications Hydro forming – Rubber pad forming – Metal spinning – Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming – Incremental forming.

UNIT V MANUFACTURE OF PLASTIC COMPONENTS 9

Types and characteristics of plastics – Molding of thermoplastics & Thermosetting polymers– working principles and typical applications – injection molding – Plunger and screw machines – Compression molding, Transfer Molding – Typical industrial applications – introduction to blow molding – Rotational molding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics- duff moulding.

TOTAL : 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the principle of different metal casting processes.
CO2: Illustrate the different bulk deformation processes.
CO3: Describe the various metal joining processes.
CO4: Apply the various sheet metal forming process.
CO5: Apply suitable molding technique for manufacturing of plastics components.

TEXT BOOKS:

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

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. Hajra Chouldhary 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

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	2	-	-	2	3	1	1	-	-	1	3	1
2	3	-	2	-	-	2	3	1	1	-	-	1	3	1
3	3	-	2	-	-	2	2	1	1	-	-	1	3	1
4	3	-	2	-	-	2	2	1	1	-	-	1	3	1
5	3	-	2	-	2	2	2	1	1	-	-	1	3	1
Low (1) Medium (2) High (3)														

ME2381 COMPUTER AIDED MACHINE DRAWING L T P C
0 0 4 2

COURSE OBJECTIVES:

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

PART I DRAWING STANDARDS & FITS AND TOLERANCES 12

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits – Tolerancing of individual dimensions IS919- Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of Geometric Dimensioning &Tolerancing.

PART II 2D DRAFTING 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, Oldham's, Muff, Gear couplings.
4. Joints – Universal, Knuckle, Gib& Cotter, Strap, Sleeve &Cotter joints.
5. Engine parts – Piston, Connecting Rod, Crosshead (vertical and horizontal), Stuffing box, multi-plate clutch.
6. Machine Components – Screw Jack, Machine Vice, Lathe Tail Stock, Lathe Chuck, Plummer Block, Vane and Gear pumps.

Total: 20% of classes for theory classes and 80% of classes for practice
Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D CAD software.

TOTAL :60 PERIODS

COURSE OUTCOMES:

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

CO1: Prepare standard drawing layout for modelled assemblies with BoM.
CO2: Model orthogonal views of machine components.
CO3: Prepare standard drawing layout for modelled parts.

TEXT BOOKS:

1. Gopalakrishna K.R., "Machine Drawing", 17th Edition, Subhas Stores Books Corner, Bangalore, 2003.
2. N. D. Bhatt and V.M. Panchal, "Machine Drawing", 51st Edition, Charator Publishers, 2022.

REFERENCES:

1. K. L Narayana, P.Kannaiah, K.Venkata Reddy, Machine Drawing , 15 Edition , New Age International Publication
2. Goutam Pohit and Goutam Ghosh, “Machine Drawing with AutoCAD”, 1st Edition,Pearson Education, 2004
3. Junnarkar, N.D., “Machine Drawing”, 1st Edition, Pearson Education, 2004
4. N. Siddeshwar, P. Kanniah, V.V.S. Sastri,” Machine Drawing”, published by Tata McGrawHill,2006
5. S. Trymbaka Murthy, “A Text Book of Computer Aided Machine Drawing”, CBS Publishers, New Delhi, 2007

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	2	-	-	3	-	-	-	3	2	-	3	3	2
2	1	2	-	-	3	-	-	-	3	2	-	3	3	2
3	1	2	-	-	3	-	-	-	3	2	-	3	3	2
Low (1) ; Medium (2) High (3)														

ME2382 MANUFACTURING TECHNOLOGY LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

1. To Select appropriate tools, equipment's and machines to complete a given job.
2. To Perform various welding process using GMAW and fabricating gears using gear making machines.
3. To Perform various machining process such as rolling, drawing, turning, shaping, drilling, milling and analysing the defects in the cast and machined components.

LIST OF EXPERIMENTS

1. Fabricating simple structural shapes using Metal Arc Welding machine.
2. Preparing green sand moulds with cast patterns.
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. Generating gears using gear shaping machine.
11. Grinding components using cylindrical or centerless grinding machine.
12. Grinding components using surface grinding machine.
13. Cutting force calculation using dynamometer in milling machine.
14. Cutting force calculation using dynamometer in lathe machine.

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1.	Centre Lathes	7 Nos.
2.	Shaper	1 No.
3.	Horizontal Milling Machine	1 No.
4.	Vertical Milling Machine	1 No.
5.	Surface Grinding Machine	1 No.
6.	Cylindrical Grinding Machine	1 No.
7.	Radial Drilling Machine	1 No.
8.	Lathe Tool Dynamometer	1 No.
9.	Milling Tool Dynamometer	1 No.
10.	Gear Hobbing Machine	1 No.
11.	Gear Shaping Machine	1 No.
12.	Arc welding transformer with cables and holders	2 Nos.
13.	Oxygen and Acetylene gas cylinders, blow pipe and other welding	1 No.
14.	Moulding table, Moulding equipments	2 Nos.

TOTAL :60 PERIODS

COURSE OUTCOMES

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

CO1: Demonstrate the safety precautions exercised in the mechanical workshop and join two metals using GMAW.

CO2: **M**ake the work piece as per given shape and size using machining process such as rolling, drawing, turning, shaping, drilling and milling.

CO3: **M**ake the gears using gear making machines and analyze the defects in the cast and machined components.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	-	-	-	-	1	-	2	-	-	1	1	1
2	3	-	-	-	-	-	1	-	2	-	-	1	1	1
3	3	-	-	-	-	-	1	-	2	-	-	1	1	1
Low (1) ; Medium (2) ; High (3)														

GE2381 **PROFESSIONAL DEVELOPMENT** **L T P C**
0 0 2 1

COURSE OBJECTIVES:

1. To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.
2. To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
3. To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered
4. To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD: **10 Hours**

Create and format a document
Working with tables
Working with Bullets and Lists
Working with styles, shapes, smart art, charts
Inserting objects, charts and importing objects from other office tools
Creating and Using document templates
Inserting equations, symbols and special characters
Working with Table of contents and References, citations Insert and review comments
Create bookmarks, hyperlinks, endnotes footnote
Viewing document in different modes
Working with document protection and security
Inspect document for accessibility

MS EXCEL: **10 Hours**

Create worksheets, insert and format data
Work with different types of data: text, currency, date, numeric etc.
Split, validate, consolidate, Convert data
Sort and filter data
Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
Work with Lookup and reference formulae
Create and Work with different types of charts
Use pivot tables to summarize and analyse data
Perform data analysis using own formulae and functions
Combine data from multiple worksheets using own formulae and built-in functions to generate results
Export data and sheets to other file formats
Working with macros
Protecting data and securing the workbook

MS POWERPOINT: **10 Hours**

Select slide templates, layout and themes
Formatting slide content and using bullets and numbering
Insert and format images, smart art, tables, charts
Using Slide master, notes and handout master
Working with animation and transitions
Organize and Group slides
Import or create and use media objects: audio, video, animation
Perform slideshow recording and Record narration and create presentable videos

TOTAL: 30 PERIODS

COURSE OUTCOMES

On successful completion the students will be able to

CO1: Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements

CO2: Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding

CO3: Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

ME2411 THEORY OF MACHINES L T P C
3 0 0 3

COURSE OBJECTIVES:

1 To study 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 To study the basic concepts of toothed gearing and kinematics of gear trains
3 To analyze the effects of friction in machine elements and the force-motion relationship in components subjected to external forces and analyzing of standard mechanisms.
4 To analyze the undesirable effects of unbalances resulting from prescribed motions in mechanism .
5 To analyze the effect of dynamics of 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– Analytical methods – computer approach – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of followers motion – circular arc and tangent cams.

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 AND FORCE ANALYSIS 9

Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes– Friction in vehicle propulsion and braking - Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions - Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members.

UNIT – IV BALANCING 9

Static and dynamic balancing – Balancing of rotating masses – Balancing a single cylinder engine – Balancing of Multi-cylinder inline, V-engines – Partial balancing in engines – Balancing of linkages – Balancing machines-Field balancing of discs and rotors.

UNIT – V FREE AND FORCED VIBRATION 9

Free vibrations – Equations of motion – Natural Frequency – Damped Vibration – Bending critical speed of simple shaft – Torsional vibration – Forced vibration – Harmonic Forcing – Vibration isolation - Gyroscopic principles.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Discuss the basics of mechanism.
CO2: Solve problems on gears and gear trains.
CO3: Examine friction in machine elements, the static and dynamic forces of mechanisms.
CO4: Calculate the balancing masses and their locations of reciprocating and rotating masses
CO5: Compute the frequency of free vibration, forced vibration and damping coefficient.

TEXT BOOKS:

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, 3rd edition 2019.

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., 2nd edition,2014.
3. Rattan, S.S, "Theory of Machines", McGraw-Hill Education Pvt. Ltd., 5th edition 2019.
4. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill, 2013.
5. Wilson and Sadler, Kinematics and Dynamics of Machinery, Pearson, 2008.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	1	-	-	1	-	-	-	1	2	1
2	3	2	2	-	1	-	-	1	-	-	-	1	2	1
3	3	2	2	-	1	-	-	1	-	-	-	1	2	1
4	3	2	2	-	1	-	-	1	-	-	-	1	2	1
5	3	2	2	-	1	-	-	1	-	-	-	1	2	1
Low (1) ; Medium (2) ; High (3)														

ME2412 THERMAL ENGINEERING L T P C
4 0 0 4

COURSE OBJECTIVES:

1. To learn the concepts and laws of thermodynamics to predict the operation of thermodynamic cycles and performance of Internal Combustion (IC) engines and Gas Turbines.
2. To analyze the performance of steam nozzle, calculate critical pressure ratio.
3. To evaluate the performance of steam turbines through velocity triangles, understand the need for governing and compounding of turbines.
4. To analyze the working of IC engines and various auxiliary systems present in IC engines.
5. To evaluate the various performance parameters of IC engines.

UNIT I THERMODYNAMIC CYCLES 12

Air Standard Cycles – Carnot, Otto, Diesel, Dual, Brayton – Cycle Analysis, Performance and Comparison, Basic Rankine Cycle, modified, reheat and regenerative cycles.

UNIT II STEAM NOZZLES AND INJECTOR 12

Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow.

UNIT III STEAM AND GAS TURBINES 12

Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing. Gas turbine cycle analysis – open and closed cycle. Performance and its improvement - Regenerative, Intercooled, Reheated cycles and their combination.

UNIT IV INTERNAL COMBUSTION ENGINES – FEATURES AND COMBUSTION 12

IC engine – Classification, working, components and their functions. Ideal and actual: Valve and port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison. Geometric, operating, and performance comparison of SI and CI engines. Desirable properties and qualities of fuels. Air-fuel ratio calculation – lean and rich mixtures. Combustion in SI & CI Engines – Knocking – phenomena and control.

UNIT V INTERNAL COMBUSTION ENGINE PERFORMANCE AND AUXILIARY SYSTEMS 12

Performance and Emission Testing, Performance parameters and calculations. Morse and Heat Balance tests. Multipoint Fuel Injection system and Common rail direct injection systems. Ignition systems – Magneto, Battery and Electronic. Lubrication and Cooling systems. Concepts of Supercharging and Turbocharging – Emission Norms

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply thermodynamic concepts to different air standard cycles and solve problems.
CO2: Solve the problems in steam nozzle and calculate critical pressure ratio.
CO3: Explain the flow in steam turbines, draw velocity diagrams, flow in Gas turbines and solve problems.
CO4: Explain the functioning and features of IC engine, components and auxiliaries.
CO5: Calculate the various performance parameters of IC engines

TEXT BOOKS:

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.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1	-	-	-	-	-	-	-	1	2	1
2	3	2	2	1	-	-	-	-	-	-	-	1	2	1
3	3	2	2	1	-	-	-	-	-	-	-	1	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	2	1
5	3	2	1	1	-	-	-	-	-	-	-	1	2	1
Low (1) ; Medium (2) ; High (3)														

ME2413 HYDRAULICS AND PNEUMATICS L T P C

3 0 0 3

COURSE OBJECTIVES:

1. To provide the knowledge on the working principles of fluid power systems.
2. To study the fluids and components used in modern industrial fluid power system.
3. To develop the design, construction and operation of fluid power circuits.
4. To learn the working principles of pneumatic power system and its components.
5. To provide the knowledge of trouble shooting methods in fluid power systems.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS 9

Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids - Properties of fluids and selection – Basics of Hydraulics – Pascal's Law – Principles of flow - Friction loss – Work, Power and Torque- Problems, Sources of Hydraulic power: Pumping Theory-– Pump Classification – Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criteria of pumps – Fixed and Variable displacement pumps – Problems

UNIT – II HYDRAULIC ACTUATORS AND CONTROL COMPONENTS 9

Hydraulic Actuators: Cylinders – Types and construction, Application, Hydraulic cushioning – Rotary Actuators-Hydraulic motors - Control Components: Direction Control, Flow control and pressure control valves – Types, Construction and Operation – Accessories: Reservoirs, Pressure Switches – Filters –types and selection- Applications – Fluid Power ANSI Symbols – Problems

UNIT – III HYDRAULIC CIRCUITS AND SYSTEMS 9

Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Deceleration circuits, Sizing of hydraulic systems, Hydrostatic transmission, Electro hydraulic circuits, – Servo and Proportional valves – Applications- Mechanical, hydraulic servo systems.

UNIT – IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS 9

Properties of air –Air preparation and distribution – Filters, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit –classification- single cylinder and multi cylinder circuits-Cascade method –Integration of fringe circuits, Electro Pneumatic System – Elements – Ladder diagram – timer circuits-Problems, Introduction to fluidics and pneumatic logic circuits

UNIT – V TROUBLE SHOOTING AND APPLICATIONS 9

Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Conditioning of hydraulic fluids Design of hydraulic circuits for Drilling, Planning, Shaping, Surface grinding, Press and Forklift applications- mobile hydraulics; Design of Pneumatic circuits for metal working, handling, clamping counter and timer circuits. – Low-cost Automation – Hydraulic and Pneumatic power packs, IOT in Hydraulics and pneumatics.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Apply the working principles of fluid power systems and hydraulic pumps.
CO2: Apply the working principles of hydraulic actuators and control components.
CO3: Design and develop hydraulic circuits and systems.
CO4: Apply the working principles of pneumatic circuits and power system and its components.
CO5: Identify various troubles shooting methods in fluid power systems.

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with Applications", Prentice Hall, 2009.
2. James A. Sullivan, "Fluid Power Theory and Applications", Fourth Edition, Prentice Hall, 1997

REFERENCES:

1. Jagadeesha. T., "Pneumatics Concepts, Design and Applications ", Universities Press, 2015.
2. Joshi.P., Pneumatic Control", Wiley India, 2008.
3. Majumdar, S.R., "Oil Hydraulics Systems – Principles and Maintenance",TataMcGraw Hill, 2001.
4. Shanmugasundaram.K., "Hydraulic and Pneumatic Controls". Chand & Co, 2006.
5. Srinivasan.R., "Hydraulic and Pneumatic Controls", Vijay Nicole Imprints, 3rd edition,2019.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	1	1	-	-	-	-	-	-	-	1	2	2
2	2	1	1	1	-	-	-	-	-	-	-	1	2	2
3	2	1	1	1	-	-	-	-	-	-	-	1	2	2
4	2	1	1	1	-	-	-	-	-	-	-	1	2	2
5	2	1	1	1	-	-	-	-	-	-	-	1	2	2
Low (1) ; Medium (2) ; High (3)														

ME2414 MANUFACTURING TECHNOLOGY L T P C

3 0 0 3

COURSE OBJECTIVES:

1. To study the concepts and basic mechanics of metal cutting and the factors affecting machinability
2. To learn the working of basic and advanced turning machines.
3. To teach the basics of machine tools with reciprocating and rotating motions and abrasive finishing processes.
4. To study the constructional features of CNC machine tool and the basics of CNC programming concepts to develop the part programme.
5. To learn the basics of additive manufacturing and powder metallurgy

UNIT – I MECHANICS OF METAL CUTTING 9

Mechanics of chip formation, forces in machining, Types of chip, cutting tools – single point cutting tool nomenclature, orthogonal and oblique metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT – II TURNING MACHINES 9

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, surface roughness in turning, machining time and power estimation. Special lathes - Capstan and turret lathes- tool layout – automatic lathes: semi-automatic – single spindle: Swiss type, automatic screw type – multi spindle

UNIT – III RECIPROCATING AND ROTARY MACHINE TOOLS 9

Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutters– machining time calculation – Gear cutting, gear hobbing and gear shaping – gear finishing methods Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding, internal grinding - micro finishing methods

UNIT – IV CNC MACHINES AND PROGRAMMING OF CNC MACHINE TOOLS 9

Computer Numerical Control (CNC) machine tools, constructional details, special features – Drives, Recirculating ball screws, tool changers; CNC Control systems – Open/closed, point-to-point/continuous - Coordinates, axis and motion, Absolute vs Incremental, Interpolators, Polar coordinates, Program planning, G and M codes, Manual part programming for CNC machining centers and Turning centers – Fixed cycles, Loops and subroutines.

UNIT – V INTRODUCTION TO ADDITIVE MANUFACTURING AND POWDER METALLURGY 9

Need-Additive Manufacturing Technology in product development- Materials for Additive Manufacturing Technology – calcifications of additive manufacturing - liquid bases-Stereo lithography Apparatus (SLA)-Principle, process, advantages and applications - Solid based system –Fused Deposition Modelling - Principle, process, advantages and applications-powder based-selective laser sintering-concept of powder metallurgy-process-applications

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Apply the mechanism of metal removal process and to identify the factors involved in improving machinability.

CO2: Describe the constructional and operational features of centre lathe and other special purpose lathes.

CO3: Describe the constructional and operational features of reciprocating machine tools.

CO4: Apply the constructional features and working principles of CNC machine tool and also demonstrate the Program through planning and writing to manufacture a given component.

CO5: Describe the concepts of additive manufacturing and powder metallurgy.

TEXT BOOKS:

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

REFERENCES:

1. Roy. A. Lindberg, Processes and materials of manufacture, PHI / Pearson education, 2006.
2. Geofrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", McGraw Hill, 1984.
3. Rao. P.N "Manufacturing Technology," Metal Cutting and Machine Tools, Tata McGraw- Hill, New Delhi, 2009.
4. A. B. Chattopadhyay, Machining and Machine Tools, Wiley, 2nd edition, 2017.
5. Peter Smid, CNC Programming Handbook, Industrial Press Inc.; Third edition, 2007

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	1	1	1	2	-	-	-	-	2	3	2
2	3	3	2	1	1	1	2	-	-	-	-	2	3	2
3	3	3	2	1	1	1	2	-	-	-	-	2	3	2
4	3	3	2	1	1	1	2	-	-	-	-	2	3	2
5	3	3	2	1	1	1	2	-	-	-	-	2	3	2
Low (1) ; Medium (2) ; High (3)														

ME2415 STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS L T P C

3 0 0 3

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 compute slopes and deflections in determinate beams by various methods.
4. To determine stresses and deformation in circular shafts and helical spring due to torsion.
5. To study the stresses and deformations induced in column, 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 - Volumertric 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 – Cantilever, Simply supported and over hanging beams. Theory of simple bending – Bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III DEFLECTION OF BEAMS 9

Elastic curve - Governing differential equation - Double integration method - Macaulay's method - Area moment method - Conjugate beam method for computation of slope and deflection of determinant beams.

UNIT IV TORSION 9

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – Combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel.

UNIT V COLUMNS AND CYLINDERS 9

Euler's Column theory - critical loads for prismatic columns with different end conditions – Effective length – Limitations – Ranking – Gordon formula. Stresses in thin cylindrical shell due to internal pressure - circumferential and longitudinal stresses - Deformation in thin cylinders – Spherical shells subjected to internal pressure – Deformation in spherical shells – Thick cylinders - Lame's theory.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
CO2: Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
CO3: Calculate slope and deflection in beams using different methods.
CO4: Apply basic equation of torsion in designing of shafts and helical springs

CO5: Analyze the load carrying capacity of columns, thin and thick shells for applied pressures.

TEXT BOOKS:

1. Rajput R.K. “Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 7th edition, 2018.
2. Rattan S.S., “Strength of Materials", Tata McGraw Hill Education Pvt .Ltd., New Delhi, 2017.

REFERENCES:

1. Singh. D.K., “Strength of Materials”, Ane Books Pvt Ltd., New Delhi, 2021.
2. Egor P Popov, “Engineering Mechanics of Solids”, 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
3. Beer. F.P. & Johnston. E.R. “Mechanics of Materials”, Tata McGraw Hill, 8th Edition, New Delhi 2019.
4. Vazirani. V.N, Ratwani. M.M, Duggal .S.K “Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1”, Khanna Publishers, New Delhi 2014.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	2	3	1	3	2	3	1	3	2	2
2	3	3	3	3	2	3	1	3	2	3	1	3	2	2
3	3	3	3	3	2	3	1	3	2	3	1	3	2	2
4	3	3	3	3	2	3	1	3	2	3	1	3	2	2
5	3	3	3	3	2	3	1	3	2	3	1	3	2	2
Low (1) ; Medium(2) ; High(3)														

GE2421 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY L T P C
2 0 0 2

COURSE OBJECTIVES

1. To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
2. To impart knowledge on the causes, effects and control or preventive measures of environmental pollution
3. To identify new renewable energy resources and contribute to the sustainable measures to conserve them for future generations.
4. To facilitate the understanding of global and Indian scenario of regional and local environmental issues and providing solutions to lead sustainability.
5. To demonstrate the knowledge of green technology to conserve the environment.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Biodiversity- Definition-Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ. Field visit of simple ecosystem.

UNIT II ENVIRONMENTAL POLLUTION 6

Definition, Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection Acts. Environmental Impact Assessment.

UNIT III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT 6

Sustainable Development-Definition, concept, needs and challenges-GDP-economic and social aspects of sustainability-measures of sustainability-millennium development goals, and protocols-targets, indicators and intervention areas. Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V SUSTAINABILITY PRACTICES 6

Zero waste and 3R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Energy Cycles- carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio- economical and technological change.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Anjali Bagad, " Environmental Sciences and Sustainablity",1st Edition, Technical Publications, Pune, 2022.

REFERENCE BOOKS:

1. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
2. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" 3rd Edition. Orient BlackswanPvt. Ltd. 2021.
3. Tyler Miller, G and Scott Spoolman " Environmental Science" Cengage Learning; 16th edition, 2018.
4. Ravikrishnan, A " Environmental Sciences and Sustainablity",15th Edition, Sri Krishna Hitech Publishing Company Pvt Ltd. 2023.

COURSE OUTCOMES:

At the end of the course, students are able

CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2: To identify the causes, effects of various environmental pollution and contribute to the preventive measures in the immediate society.

CO3: To recognize different forms of renewable energy resources and apply them for suitable applications for technological advancement and societal development.

CO4: To identify and apply the knowledge of engineering & technology for environmental management to achieve sustainability.

CO5: To facilitate the understanding of global and Indian scenario of green technologies for future generations.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	1	-	3	-	-	-	-	-
2	3	-	3	-	-	-	2	-	3	-	-	-	-	-
3	-	-	-	-	-	2	2	-	-	-	-	-	-	-
4	-	3	3	-	-	-	2	3	-	-	-	-	-	-
5	-	3	3	-	-	-	2	3	-	-	-	-	-	-
Low (1); Medium (2); High (3)														

ME2481 STRENGTH OF MATERIALS AND FLUID MACHINERY LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

1. To study the mechanical properties of metals, wood and spring by testing in laboratory.
2. To verify the principles studied in fluid mechanics and machinery theory by performing experiments in laboratory.

UNIT – I STRENGTH OF MATERIALS **30**

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Torsion test on mild steel rod
3. Hardness test on metal (Rockwell and Brinell Hardness)
4. Compression test on helical spring
5. Deflection test on carriage spring
6. Double shear test on Mild steel and Aluminium rods.
7. Impact test on metal specimen (Izod and Charpy)

UNIT – II FLUID MECHANICS AND MACHINERY LABORATORY **30**

LIST OF EXPERIMENTS

1. (a) Determination of coefficient of discharge of a venturimeter
   (b) Determination of friction factor for flow through pipes
2. (a) Determination of metacentric height
   (b) Determination of forces due to impact of jet on a fixed plate
3. Characteristics of centrifugal pumps
4. Characteristics of reciprocating pump
5. Characteristics of Pelton wheel turbine
6. Determination of the Coefficient of discharge of given Orifice meter
7. Calculation of the rate of flow using Rota meter.
8. Conducting experiments and drawing the characteristic curves of Gear pump.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS (STRENGTH OF MATERIALS LAB)

Sl. No.	Name of the Equipment	Qty.
1	Universal Testing Machine	1 No.
2	Torsional Testing Machine	1 No.
3	Rockwell Hardness Test Equipment	1 No.
4	Brinell Hardness Test Equipment	1 No.
5	Deflection Test Setup	1 No.
6	Compression Test Setup for Helical Spring	1 No.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS (FLUID MECHANICS AND MACHINERY LAB)

Sl. No.	Name of the Equipment	Qty.
1	Friction Factor Apparatus Setup	1 No.
2	Metacentric Height Apparatus Setup	1 No.
3	Impact of Jet Setup	1 No.
4	Centrifugal Pump Setup	1 No.
5	Reciprocation Pump Setup	1 No.
6	Pelton Wheel Turbine Setup	1 No.
7	Venturimeter Setup	1 No.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1: Determine the tensile, torsion and hardness properties of metals by testing

CO2: Determine the stiffness properties of helical and carriage spring

CO3: Apply the conservation laws to determine the coefficient of discharge of a venturimeter and finding the friction factor of given pipe

CO4: Apply the fluid static and momentum principles to determine the metacentric height and forces due to impact of jet

CO5: Determine the performance characteristics of turbine, rotodynamic pump and positive displacement pump.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	3	3	1	1	1	3	1	1	2	2	2
2	3	2	1	3	3	1	1	1	3	1	1	2	3	2
3	3	3	2	3	2	1	1	1	3	1	1	2	3	2
4	3	-	-	-	-	1	1	1	3	2	-	2	2	2
5	3	-	-	-	-	1	1	1	3	2	-	2	2	2
Low (1); Medium (2); High (3)														

ME2482 THERMAL ENGINEERING LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

1. To study the valve and port timing diagram and performance characteristics of IC engines
2. To study the Performance of refrigeration cycle / components
3. To study the Performance and Energy Balance Test on a Steam Generator.

PART I: IC ENGINES LABORATORY 45

LIST OF EXPERIMENTS

1. Valve Timing and Port Timing diagrams.
2. Actual p-v diagrams of IC engines.
3. Performance Test on four – stroke Diesel Engine.
4. Heat Balance Test on 4 – stroke Diesel Engine.
5. Morse Test on Multi-Cylinder Petrol Engine.
6. Retardation Test on a Diesel Engine.
7. Determination of p-θ diagram and heat release characteristics of an IC engine.
8. Determination of Flash Point and Fire Point of various fuels / lubricants.
9. Performance test on a two stage Reciprocating Air compressor
10. Determination of COP of a refrigeration system.
11. Performance test on single cylinder petrol engine.

PART II STEAM LABORATORY 15

LIST OF EXPERIMENTS

1. Study of Steam Generators and Turbines.
2. Performance and Energy Balance Test on a Steam Generator.
3. Performance and Energy Balance Test on Steam Turbine.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

Sl. No.	Name of the Equipment	Qty.
1	I.C Engine – 2 stroke and 4 stroke model	1 set
2	Apparatus for Flash and Fire point	1 No.
3	4-stroke Diesel Engine with mechanical loading	1 No.
4	4-stroke Diesel Engine with hydraulic loading	1 No.
5	4-stroke Diesel Engine with electrical loading	1 No.
6	Multi-Cylinder Petrol Engine	1 No.
7	Single Cylinder Petrol Engine	1 No.
8	Data Acquisition system with any one of the above engines	1 No.
9	Steam Boiler with turbine setup	1 No.

10	Two Stage reciprocating air compressor	1 No.
11	Refrigeration Test rig	1 No.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Conduct tests to evaluate performance characteristics of IC engines
CO2: Conduct tests to evaluate the performance of refrigeration cycle
CO3: Conduct tests to evaluate Performance and Energy Balance on a Steam Generator.

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	1	1	-	-	-	-	1	-	-	1	1	1
2	2	2	1	1	-	-	-	-	1	-	-	1	1	1
3	2	2	1	1	-	-	-	-	1	-	-	1	1	1
Low (1); Medium (2); High (3)														