NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)
Erode-638 052, Tamilnadu, India, Phone: 04294 – 225585

Curriculum and Syllabi

for

B.E – Mechanical Engineering [R22]

[CHOICE BASED CREDIT SYSTEM]

(This Curriculum and Syllabi are applicable to Students admitted from the academic year (2022-23) onwards)

AUGUST 2022

INSTITUTE VISION AND MISSION	
VISION	• To be an Institute of excellence providing quality Engineering, Technology and Management education to meet the ever changing needs of the society.
MISSION	• To provide quality education to produce ethical and competent professionals with social Responsibility • To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real- world problems. • To create a learner centric environment and improve continually to meet the changing global needs.

B.E – MECHANICAL ENGINEERING	
VISION	• To be recognised as a centre of excellence in the field of Mechanical Engineering and to produce competent engineers with multi-disciplinary exposure to meet the changing needs of the society.
MISSION	• To enrich technical knowledge and skills by imparting quality education with ethics and social responsibility. • To empower the students in the thrust areas of Mechanical, Allied Engineering and Entrepreneurship in the continually changing global market. • To provide a conducive learning environment for improving continually to cater the needs of the society.
PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	**The graduates of Mechanical Engineering will be** **PEO1: Core Competency:** A Successful professional with core competency and inter-disciplinary skills to satisfy the Industrial needs. **PEO2: Research, Innovation and Entrepreneurship:** Capable of identifying technological requirements for the society and providing innovative solutions to real time problems. **PEO3: Ethics, Human values and Life-long learning:** able to apply professional and ethical practices in their career through continuous learning.
PROGRAMME SPECIFIC OUTCOMES (PSO)	**The students of Mechanical Engineering will be able to** • Identify, formulate and analyze the problems of Mechanical, Allied Engineering systems and product development. • Apply appropriate computer aided engineering tools for modeling, simulation, analysis, and manufacturing techniques to solve engineering problems.

PROGRAM OUTCOMES:

At the end of this programme the students will be able to

a-l	GRADUATE ATTRIBUTES	PO No.	PROGRAMME OUTCOMES
a	**Engineering Knowledge**	PO1	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
b	**Problem analysis**	PO2	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
c	**Design / development of solutions**	PO3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.
d	**Conduct investigations of complex problems**	PO4	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.
e	**Modern Tool Usage**	PO5	Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f	**The Engineer and Society**	PO6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g	**Environment and Sustainability**	PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge and need for the sustainable development.
h	**Ethics**	PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i	**Individual and Team Work**	PO9	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
j	**Communication**	PO10	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 and make effective presentations and give and receive clear instructions.
k	**Project Management and Finance**	PO11	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, manage projects and in multidisciplinary environments.
l	**Lifelong Learning**	PO12	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.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Programme Educational Objectives and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	2	3	2	1	1	2	1	2	2	3
2	3	3	3	3	3	1	1	2	1	2	2	3
3	3	3	3	3	3	1	1	2	1	2	2	3

Contribution 1: Reasonable 2: Significant 3: Strong

MAPPING OF PROGRAM SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAM SPECIFIC OUTCOMES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	2	3	2	1	1	1	1	1	1	2
2	3	3	3	3	3	2	2	3	1	3	3	3

Contribution 1: Reasonable 2: Significant 3: Strong

SEMESTER: I									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1	22MAN01	Induction Programme	MC	-	-	-	-	-	-
THEORY									
2	22EYA01	Professional Communication - I	HSMC		4	2	0	2	3
3	22MYB01	Calculus and linear algebra	BSC		4	3	1	0	4
4	22CYB02	Chemistry for Engineers	BSC		3	3	0	0	3
5	22EEC02	Basic Electrical Engineering	ESC		3	3	0	0	3
6	22MEC02	Engineering Graphics and drafting (Theory + Lab)	ESC		5	3	0	2	4
7	22GYA01	தமிழர்மரபு /Heritage of Tamils	HSMC	-	1	1	0	0	1
PRACTICAL									
8	22GEP01	Engineering Practices Laboratory	ESC		4	0	0	4	2
9	22CYP01	Chemistry Laboratory	BSC		2	0	0	2	1
Mandatory Non Credit Courses									
10	22MAN02	Soft/Analytical Skills - I	**MC**		3	1	0	2	0
11	22MAN03	Yoga – I	**MC**		1	0	0	1	0
TOTAL					**30**	**16**	**1**	**13**	**21**

SEMESTER: II									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22EYA02	Professional Communication - II	HSMC	22EYA01	4	2	0	2	3
2	22MYB02	Partial Differential Equations and Transform Techniques	BSC		4	3	1	0	4
3	22PYB04	Physics for Mechanical Engineering	BSC		3	3	0	0	3
4	22CSC01	Problem Solving and C Programming	ESC		3	3	0	0	3
5	22ECC03	Basic Electronics and instrumentation Engineering	ESC		3	3	0	0	3
6	22MEC03	Engineering Mechanics	ESC		3	2	1	0	3
7	22GYA02	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	22GYA01	1	1	0	0	1
PRACTICAL									
8	22CSP01	Problem Solving and C Programming Laboratory	ESC		4	0	0	4	2
9	22PYP01	Physics Laboratory	BSC		2	0	0	2	1
Mandatory Non Credit Courses									
10	22MAN04	Soft / Analytical Skills - II	MC	22MAN02	3	1	0	2	0
11	22MAN05	Yoga – II	MC		1	0	0	1	0
TOTAL					**31**	**18**	**2**	**11**	**23**

SEMESTER: III									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MYB03	Statistics And Numerical Methods	BSC		4	3	1	0	4
2	22MEC04	Engineering Thermodynamics	PCC		3	2	1	0	3
3	22MEC05	Fluid Mechanics and Machinery (Theory + Lab)	ESC		5	3	0	2	4
4	22MEC06	Manufacturing Processes	PCC		3	3	0	0	3
5	22MEC07	Engineering materials and metallurgy	PCC		3	3	0	0	3
PRACTICAL									
6	22MEP02	Computer Aided Machine Drawing	BSC		4	0	0	4	2
Mandatory Non Credit Courses									
7	22MAN07	Soft / Analytical Skills – III	MC	22MAN04	3	1	0	2	0
8	22MAN09	Indian Constitution	MC		1	1	0	0	0
TOTAL					**26**	**16**	**2**	**8**	**19**

SEMESTER: IV									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MEC09	Thermal Engineering Systems	PCC	22MEC04	4	3	1	0	4
2	22MEC10	Subtractive Manufacturing Processes	PCC	2MEC06	3	3	0	0	3
3	22MEC11	Strength of Materials (Theory + Lab)	PCC		5	3	0	2	4
4	22MEC12	Theory of Machines (Theory + Lab)	PCC		4	3	0	2	4
5	E1	Elective(OEC/PEC)	OEC / PEC		3	3	0	0	3
PRACTICAL									
6	22MEP03	Thermal Engineering Systems Laboratory	PCC		4	0	0	4	2
7	22MEP04	Subtractive Manufacturing Processes Laboratory	PCC		4	0	0	4	2
Mandatory Non Credit Courses									
8	22MAN08	Soft/Analytical Skills - IV	MC		3	1	0	2	0
9	22MAN06	Environmental Science	MC		2	0	0	2	0
10	22GED01	Personality and Character Development	MC		2	0	0	2	0
TOTAL					**34**	**16**	**1**	**18**	**22**

SEMESTER: V									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MEC13	Machine Design	PCC		**4**	**3**	**1**	**0**	**4**
2	22MEC14	Metrology and Measurements	PCC		**3**	**3**	**0**	**0**	**3**
3	22MEC15	Heat and Mass Transfer	PCC		**3**	**3**	**0**	**0**	**3**
4	22MEC16	Hydraulics and Pneumatics	PCC		**3**	**3**	**0**	**0**	**3**
5	E2	Elective(PEC)	PEC		**3**	**3**	**0**	**0**	**3**
6	E3	Elective(OEC/PEC)	PEC		**3**	**3**	**0**	**0**	**3**
PRACTICAL									
7	22MEP05	Heat and Mass Transfer Laboratory	PCC		4	0	0	4	2
8	22MEP06	Metrology and Measurements Laboratory	PCC		4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN10	Soft/Analytical Skills - V	MC		3	1	0	2	0
10	22MAN11	Certification Course - I	MC		1	0	0	1	0
TOTAL					**31**	**19**	**1**	**11**	**23**

SEMESTER: VI									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MEC17	Finite Element Analysis	PCC		3	3	0	0	3
2	22MEC18	Mechatronics & IOT	PCC		3	3	0	0	3
3	EM1	Elective - Management	HSMC		3	3	0	0	3
4	E4	Elective(PEC)	PEC		3	3	0	0	3
5	E5	Elective(PEC)	PEC		3	3	0	0	3
6	E6	Elective(OEC)	OEC		3	3	0	0	3
PRACTICAL									
7	22MEP07	Computer Aided Analysis Laboratory	**PCC**		4	0	0	4	2
8	22MEP08	Mechatronics & IOT Laboratory	**PCC**		4	0	0	4	2
Mandatory Non Credit Courses									
9	22MAN12	Soft/Analytical Skills - VI	MC		3	1	0	2	0
10	22MAN13	Certification Course - II	MC		1	0	0	1	0
TOTAL					**30**	**19**	**0**	**11**	**22**

SEMESTER: VII									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
THEORY									
1	22MEC19	CAD / CAM / CIM	PCC		3	3	0	0	3
2	22GEA01	Universal Human Values	HSMC		2	2	0	0	2
3	E7	Elective(PEC)	PEC		3	3	0	0	3
4	E8	Elective(PEC)	PEC		3	3	0	0	3
5	E9	Elective(PEC)	PEC		3	3	0	0	3
6	E10	Elective(OEC)	OEC		3	3	0	0	3
PRACTICAL									
7	22MEP09	CAD/CAM Laboratory	PCC		4	0	0	4	2
8	22GED02	Summer Internship*	EEC		0	0	0	0	2
TOTAL					**21**	**17**	**0**	**4**	**21**

SEMESTER: VIII									
S.NO	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
PRACTICAL									
1	22MED01	Project Work	**EEC**		20	0	0	20	10
TOTAL					**20**	**0**	**0**	**20**	**10**

(A) HSC, BSC AND ESC COURSES

(a) Humanities and Social Sciences (HS)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1	22EYA01	Professional Communication - I	HSMC		4	2	0	2	3	I
2	22GYA01	Heritage of Tamils	HSMC	-	1	1	0	0	1	I
3	22EYA02	Professional Communication - II	HSMC	22EYA01	4	2	0	2	3	II
4	22GYA02	Tamils and Technology	HSMC	22GYA01	1	1	0	0	1	II
5	EM1	Elective - Management	HSMC		3	3	0	0	3	VI
6	22GEA01	Universal Human Values	HSMC		2	2	0	0	2	VII

(b) Basic Sciences (BSC)

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1	22MYB01	Calculus and linear algebra	BSC		4	3	1	0	4	I
2	22CYB02	Chemistry for Engineers	BSC		3	3	0	0	3	I
3	22CYP01	Chemistry Laboratory	BSC		2	0	0	2	1	I
4	22PYB04	Physics for Mechanical Engineering	BSC		3	3	0	0	3	II
5	22PYP01	Physics Laboratory	BSC		2	0	0	2	1	II
6	22MYB03	Statistics And Numerical Methods	BSC		4	3	1	0	4	III
7	22MEP02	Computer Aided Machine Drawing	BSC		4	0	0	4	2	III

(c) Engineering Sciences (ESC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1	22EEC02	Basic Electrical Engineering	ESC		3	3	0	0	3	I
2	22MEC02	Engineering Graphics and drafting (Theory + Lab)	ESC		5	3	0	2	4	I
3	22GEP01	Engineering Practices Laboratory	ESC		4	0	0	4	2	I
4	22ECC03	Basic Electronics and instrumentation Engineering	ESC		3	3	0	0	3	II
5	22MEC03	Engineering Mechanics	ESC		3	2	1	0	3	II
6	22CSP01	Problem Solving and C Programming Laboratory	ESC		4	0	0	4	2	II

(a) Mandatory Courses (MC)										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22MAN01	Induction Programme	MC	-	0	0	0	0	0	I
2.	22MAN02	Soft /Analytical Skills - I	MC	-	3	I	0	2	0	I
3.	22MAN03	Yoga - I	MC	-	I	0	0	I	0	I
4.	22MAN04	Soft /Analytical Skills - II	MC	22MAN02	3	I	0	2	0	II
5.	22MAN05	Yoga - II	MC	-	I	0	0	I	0	II
6.	22MAN07	Soft / Analytical Skills - III	MC	-	3	I	0	2	0	III
7.	22MAN09	Indian Constitution	MC	-	I	I	0	0	0	III
8.	22MAN08	Soft/Analytical Skills - IV	MC	-	3	I	0	2	0	IV
9.	22MAN06	Environmental Science	MC		2	0	0	2	0	IV
10.	22GED01	Personality and Character Development	MC	-	I	0	0	I	0	IV
11.	22MAN10	Soft/Analytical Skills – V	MC	-	3	I	0	2	0	V
12.	22MAN11	Certification Course – I	MC	-	I	0	0	I	0	V
13.	22MAN12	Soft/Analytical Skills – VI	MC	-	3	I	0	2	0	VI
14.	22NAN13	Certification Course – II	MC	-	I	0	0	I	0	VI

(B) PROFESSIONAL CORE COURSES (PCC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
I	22MEC04	Engineering Thermodynamics	PCC		3	2	I	0	3	III
2	22MEC06	Manufacturing Processes	PCC		3	3	0	0	3	III
3	22MEC07	Engineering materials and metallurgy	PCC		3	3	0	0	3	III
4	22MEC09	Thermal Engineering Systems	PCC		4	3	I	0	4	IV
5	22MEC10	Subtractive Manufacturing Processes	PCC		3	3	0	0	3	IV
6	22MEC11	Strength of Materials (Theory + Lab)	PCC		5	3	0	2	4	IV
7	22MEC12	Theory of Machines (Theory + Lab)	PCC		4	3	0	2	4	IV

8	22MEP03	Thermal Engineering Systems Laboratory	PCC		4	0	0	4	2	IV
9	22MEP04	Subtractive Manufacturing Processes Laboratory	PCC		4	0	0	4	2	IV
10	22MEC13	Machine Design	PCC		4	3	1	0	4	V
11	22MEC14	Metrology and Measurements	PCC		3	3	0	0	3	V
12	22MEC15	Heat and Mass Transfer	PCC		3	3	0	0	3	V
13	22MEC16	Hydraulics and Pneumatics	PCC		3	3	0	0	3	V
14	22MEP05	Heat and Mass Transfer Laboratory	PCC		4	0	0	4	2	V
15	22MEP06	Metrology and Measurements Laboratory	PCC		4	0	0	4	2	V
16	22MEC17	Finite Element Analysis	PCC		3	3	0	0	3	VI
17	22MEC18	Mechatronics & IOT	PCC		3	3	0	0	3	VI
18	22MEP07	Computer Aided Analysis Laboratory	PCC		4	0	0	4	2	VI
19	22MEP08	Mechatronics & IOT Laboratory	PCC		4	0	0	4	2	VI
20	22MEC19	CAD / CAM / CIM	PCC		3	3	0	0	3	VII
21	22MEP09	CAD/CAM Laboratory	PCC		4	0	0	4	2	VII

(C) ELECTIVE COURSES

(a) PROGRAMME SPECIFIC ELECTIVES

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1	22MEX01	Composite Materials	PSE	-	3	3	0	0	3	IV
2	22MEX02	Tool Design	PSE	-	3	3	0	0	3	IV

(b)(i) Open Electives

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22ITZ01	Python Programming	OE	-	3	3	0	0	3	IV

(D) Employability Enhancement Courses (EEC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	22GED02	Summer Internship*	EEC		0	0	0	0	2	VII
2.	22MED01	Project Work	EEC		20	0	0	20	10	VIII

Semester / Category	HSMC	BSC	PCC	ESC	EEC	PEC	OEC	Total
I	4	8		9				21
2	4	8		11				23
3		4	9	6				19
4			19				3	22
5			17			6		23
6	3		10			6	3	22
7	2		5		2	9	3	21
8					10			10
Total Credits	13	20	60	26	12	21	9	161
%	8.07%	12.42%	37.27%	16.15%	7.45%	13.04	5.59%	100.00%
AICTE Credits	12	29	58	27	16	9	9	160
%	7%	18%	36%	17%	10%	6%	6%	

22EYA01 - PROFESSIONAL COMMUNICATION - I (*Common to All Branches*)					
		L	**T**	**P**	**C**
		2	**0**	**2**	**3**
PREREQUISITE : NIL					

Course Objectives		**Course Outcomes**	
1.0	To build essential English skills to address the challenges of communication in today's work environment	1.1	The students will be able to apply knowledge of communication and language processes occur in various work environment
2.0	To comprehend the various dimensions of communication by employing LSRW skills	2.1	The students will be able to involve in diverse discourse forms utilizing LSRW skills
3.0	To deploy students in contextual initiatives by assisting them in developing communication abilities	3.1	The students will be able to participate actively in communication activities that enhance their creative skill
4.0	To facilitate students in comprehending the intent, target audience and environments of various forms of communication	4.1	The students will be able to associate with the target audience and contexts using varied types of communication
5.0	To enhance coherence, cohesion, and proficiency in both verbal and nonverbal communication in the workplace environment	5.1	The students will be able to convey the idea distinctly both in verbal and non verbal communication in work culture

UNIT I –INTRODUCTORY SKILLS	**(6+6)**
Grammar – Parts of Speech – Verb (Auxiliaries – Primary & Modal, Main Verb) -**Listening** – Listening to Short Conversations or Monologues - Listening to Experiences – Listening to Descriptions- **Speaking** – Introducing Oneself – Exchanging Personal information - Talking about food and culture - **Reading**– Reading for Interrogation – Reading Newspaper, Advertisements and Interpreting - **Writing** - Seeking Permission for Industrial Visit & In-plant Training.	
UNIT II – LANGUAGE ACUMEN	**(6+6)**
Grammar – Word Formation – Tenses (Present Tense) – Synonyms & Antonyms - **Listening** – Listening to Announcements – Listening to Interviews - Listening and Note-taking - **Speaking** – Talking about Holidays & Vacations – Narrating Unforgettable Anecdotes - **Reading** – Skimming – Scanning (Short Texts and Longer Passages) – Critical Reading - **Writing** – Instruction – Process Description.	
UNIT III – COMMUNICATION ROOTERS	**(6+6)**
Grammar– Cause and Effect – Tenses (Past Tense) – Discourse Markers - **Listening** – Listening to Telephonic Conversations – Listening to Podcasts - **Speaking** – Talking about neoteric Technologies – Eliciting information to fill a form - **Reading** –Book Reading(Motivational) - Practicing Speed Reading (reading newspaper reports & biographies) - **Writing** – Checklist – Circular, Agenda & Minutes of the Meeting.	
UNIT IV – DISCOURSE FORTE	**(6+6)**
Grammar – Tenses (Future Tense) –Yes/No & WH type questions – Negatives - **Listening** – Listening to TED/ Ink talks -**Speaking** – Participating in Short Conversations - **Reading** – Reading Comprehension (Multiple Choice / Short / Open Ended Questions) - **Writing** - E-Mail Writing.	

UNIT V – LINGUISTIC COMPETENCIES	**(6+6)**
Grammar – Articles – Homophones & Homonyms – Single line Definition – Phrasal Verb - **Listening** – Intensive listening to fill in the gapped text - **Speaking** –Expressing opinions through Situations & Role play **Reading** – Cloze Texts - **Writing** – Paragraph Writing.	
LIST OF SKILLS ASSESSED IN THE LABORATORY 1. Grammar 2. Listening Skills 3. Speaking Skills 4. Reading Skills 5. Writing Skills	
TOTAL (L:30 , P:30) = 60 PERIODS	
TEXT BOOK:	
1. Shoba K N., Deepa Mary Francis, "English for Engineers and Technologists", Volume 1, 3rd Edition, Orient BlackSwan Pvt.Ltd, Telangana, 2022.	
REFERENCES:	
1. Koneru, Aruna, "English Language Skills", Tata McGraw Hill Education (India) Private Limited, Chennai, 2006. 2. Hewings M, "Advanced English Grammar", Cambridge University Press, Chennai, 2000. 3. Jack C Richards, Jonathan Hull and Susan Proctor, "Interchange", Cambridge University Press, New Delhi, 2015 (Reprint 2021).	

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	3	3	-	2	1	-
2	-	-	-	-	-	-	-	-	3	3	-	2	1	-
3	-	-	-	-	-	-	-	-	3	3	-	2	1	-
4	-	-	-	-	-	-	-	-	3	3	-	2	1	-
5	-	-	-	-	-	-	-	-	3	3	-	2	1	-
CO (W.A)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**1**	**-**

22MYB01 - CALCULUS AND LINEAR ALGEBRA *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To develop the use of matrix algebra techniques needed by engineers for practical applications.	**1.1**	The students will be able to apply the concept of orthogonal reduction to diagonalise a given matrix.		
2.0	To use the techniques, skills and engineering tools necessary for engineering practice, with geometric concepts.	**2.1**	The students will be able to identify the geometric aspects of plane, straight line and sphere.		
3.0	To improve the ability of the students in solving geometrical applications of differential calculus problems.	**3.1**	The students will be able to evaluate the radius of curvature, circle of curvature and centre of curvature for a given curve.		
4.0	To learn the important role of mathematical concepts in engineering applications with the functions of several variables.	**4.1**	The students will be able to calculate the maxima and minima for a given function with several variables by finding the stationary points.		
5.0	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.	**5.1**	The students will be able to evaluate the area and volume by double and triple integrals.		

UNIT I - MATRICES	**(9+3)**
Characteristic Equation - Eigen values and Eigen vectors of a matrix - Cayley Hamilton Theorem (excluding proof) and its applications - Quadratic form-Reduction of a Quadratic form to canonical form by orthogonal transformation.	
UNIT II – ANALYTICAL GEOMETRY OF THREE DIMENSIONS	**(9+3)**
Equation of plane – Angle between two planes – Equation of straight lines - Coplanar lines –Equation of sphere – Orthogonal spheres.	
UNIT III - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	**(9+3)**
Curvature – Curvature in Cartesian co-ordinates-Centre and Radius of curvature-Circle of curvature-Evolutes and Involutes.	
UNIT IV - FUNCTIONS OF SEVERAL VARIABLES	**(9+3)**
Partial derivatives - Euler's theorem on homogeneous function-Jacobian-Maxima and Minima of functions of two variables-Constrained Maxima and Minima by Lagrange's multiplier method.	
UNIT V -MULTIPLE INTEGRALS	**(9+3)**
Double integration in Cartesian Co-ordinates-Change of order of integration-Area as double integral- Triple integration in Cartesian Co-ordinates-Volume as triple integrals.	
TOTAL (L:45+T:15) :60 PERIODS	

LIST OF PROGRAMS USING MATLAB (Assignment/Online Test**)**:

1. Introduction to MATLAB
2. Matrix operations – Addition, Multiplication, Transpose and Inverse
3. Characteristic equation of a Matrix
4. Eigen values and Eigen vectors of Higher order Matrices.
5. Curve Tracing
6. Determining Maxima and Minima of a function of one variable.
7. Determining Maxima and Minima of a function of two variables.
8. Evaluating double integrals
9. Evaluating triple integrals
10. Finding area between two curves.

TEXT BOOK:

1. Dr.B.S.Grewal, Higher Engineering mathematics, 42nd Edition, Khanna publications, 2012.
2. Erwin Kreyszig , Advanced Engineering mathematics , 9th Edition , JOHN Wiley & sons ,2013
3. Veerarajan.T, Engineering Mathematics of semester I & II, Third Edition, Tata McGraw Hill. ,2016

REFERENCES:

1. N.P.Bali, Manish Goyal, A Text book of Engineering Mathematics -Sem-II", 6th Edition, Laxmi Publications, 2014.
2. Kandasamy.P, Thilagavathy.K, Gunavathy .K, Engineering Mathematics for first year, 9th Rev.Ed, S.Chand & Co Ltd, 2013.
3. Glyn James, Advanced Engineering Mathematics , 7th Edition, Wiley India, 2007

Mapping of COs with POs / PSOs

COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	1	-	-	-	1	-	2	2	2	1
2	3	2	2	-	1	1	-	-	1	-	-	2	2	-
3	3	2	2	-	1	-	-	-		-	-	2	2	-
4	3	2	2	1	1	-	-	-	1	-	-	2	2	-
5	3	2	2	1	1	-	-	-	1	-	1	2	2	1
CO (W.A)	3	2	2	1	1	1	-	-	1	-	2	2	2	1

22CYB02 CHEMISTRY FOR ENGINEERS *(Common to CIVIL and MECH Branches)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE REQUISITE : NIL

Course Objectives		**Course Outcomes**	
1.0	To recognize the basic concepts of electrochemistry and understand electrochemical processes.	**1.1**	The students will be able to evaluate fundamentals of electrochemistry, electrodes, cells and electrode potentials.
2.0	To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of energy sources and storage devices.	**2.1**	The students will be able to impart knowledge on renewable energy sources like nuclear, solar, wind energy and also on storage devices.
3.0	To make the students conversant with water treatment, boiler feed water techniques	**3.1**	The students will be able to identify the various water treatment techniques for domestic and industrial purpose.
4.0	To elucidate the mechanism of corrosion and their control measures.	**4.1**	The students will be able to explore the type of corrosion and depict the methods of corrosion control.
5.0	To impart knowledge on the basic principles, types of fuels, their preparation, properties and combustion characteristics.	**5.1**	The students will be able to recommend suitable fuels for engineering processes and applications.

UNIT I – ELECTROCHEMISTRY	**(9)**
Electrode potential - Nernst equation - derivation and problems - reference electrodes - standard hydrogen electrode -calomel electrode - electrochemical series – significance - Types of cell - electrolytic and electrochemical cells -reversible and irreversible cells - potentiometric titrations (redox) - conductometric titrations (acid-base).	
UNIT II – ENERGY SOURCES AND STORAGE DEVICES	**(9)**
Nuclear energy – nuclear fission - nuclear fusion - light water nuclear power plants - breeder reactor - solar energy conversion - solar cells - solar water heater – Recent developments in solar cell materials - wind energy – batteries - types of batteries - lead acid storage battery -lithium-ion battery, Electric vehicles - working principles.	
UNIT III – WATER TECHNOLOGY AND NANO MATERIALS	**(9)**
Municipal water treatment - disinfection methods (uv, ozonation, chlorination) - desalination of brackish water - reverse osmosis - boiler troubles (scale, sludge , priming, foaming and caustic embrittlement) - treatment of boiler feed water - internal treatment (carbonate, phosphate and calgon conditioning) - external treatment - demineralization process. Nanomaterials - synthesis (laser ablation, and chemical vapour deposition method) and applications of nanomaterials.	
UNIT IV – CORROSION AND ITS CONTROL	**(9)**
Corrosion – types - chemical corrosion - pilling bedworth rule - electrochemical corrosion - mechanism-galvanic corrosion - differential aeration corrosion - factors influencing corrosion - corrosion control - sacrificial anode and impressed cathodic current methods - corrosion inhibitors - protective coatings – paints - constituents and their functions.	

UNIT V – FUELS AND COMBUSTION	(9)
Fuels: Introduction: Classification of fuels: Coal and coke: Analysis of coal (Proximate) - 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, Flue gas analysis - ORSAT method. CO2 emission and carbon foot print.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

1. Dr.Ravikrishnan, A," Engineering Chemistry I & Engineering Chemistry II , Sri Krishna Hitech Publishing chem.. Co. Pvt Ltd., 13th ed., Chennai , 2020.
2. S.S. Dara," A Text book of Engineering Chemistry", S.Chand & Co.Ltd. New Delhi, 2019.

REFERENCES:

1. 1. P.C.Jain and Monica Jain, "Engineering Chemistry", Vol I & II, Dhanpat Rai Pub, Co,New Delhi 15th ed.,2018.
2. 2. B.Sivasankar, "Engineering Chemistry" , Tata McGraw- Hill Pub.Co.Ltd.,New Delhi,2018

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	3	-	-	1	-	-	1	-	-	2	-	-
2	2	1	3	-	-	1	1	-	1	-	-	2	1	-
3	2	-	3	-	-	1	-	-	2	-	-	2	-	-
4	2	2	3	-	-	1	2	-	-	-	-	2	1	-
5	2	2	3	-	-	1	-	-	-	-	-	2	-	-
CO (W.A)	**2**	**2**	**3**	**-**	**-**	**1**	**2**	**-**	**1**	**-**	**-**	**2**	**1**	**-**

22EEC02- BASIC ELECTRICAL ENGINEERING *(For MECH Branch only)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To impart knowledge on electric circuit laws, single phase circuits	**1.1**	The student will be able to apply the basic laws and investigates the behavior of electric circuits		
2.0	To learn the basic principles of DC electrical machines and their performance.	**2.1**	The student will be able to Identify the DC electrical components and explore the characteristics of electrical machines.		
3.0	To expound the fundamentals of induction motor and applications.	**3.1**	The student will be able to analyze the various characteristics of induction & synchronous motor and applications..		
4.0	To introduce the fundamentals of single phase transformer and applications	**4.1**	The student will be able to expose the concept of transformer and its application		
5.0	To impart knowledge on Electrical drives.	**5.1**	The student will be able to understand the fundamental of Electrical drives and its application		

UNIT I - ELECTRIC CIRCUITS	**(9)**
Introduction to DC circuits-Ohm's Law – Kirchhoff's Laws – Resistive circuits-Series and parallel reduction-Introduction to AC circuits– Alternating current and Voltage-RMS and average values of sinusoidal waveforms-Power-real power, reactive power and Power factor.	
UNIT II - DC MACHINES	**(9)**
DC Generator: Construction, Types, Principle of operation, EMF equation, Characteristics. DC Motor: Principle of operation, Types, Torque equation, Characteristics and Applications.	
UNIT III - AC MACHINES	**(9)**
Single phase induction motor: Construction, Types, working principle- Three phase induction motor: Construction, Types, Torque – Slip Characteristics- Synchronous motor : Construction, working principle.	
UNIT IV - TRANSFORMERS	**(9)**
Construction, Types, Principle of operation, EMF Equation and applications.	
UNIT V -ELECTRICAL DRIVES AND ITS APPLICATIONS	**(9)**
Introduction - Selection of electric drive – types of DC and AC drives, Case study: Speed control in Electric vehicle and paper mills.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:
1. D P Kothari and I.J Nagarath, "Basic Electrical Engineering", McGraw Hill Education (India) Private Limited, 4th Edition, 2019. 2. Dubey G.K., "Fundamentals of Electrical Drives", Narosa Publishing House, New Delhi, 2nd edition, Reprint 2020
REFERENCES:
1. Mittle and V. N. Mittle, "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 2005 2. Krishnan R, Electric Motor Drives: Modeling, Analysis and Controlll, Pearson India,2015

Mapping of COs with POs / PSOs														
COs	**Pos**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	-	2	2	2	2	1	1	-	2	2	3	1
2	3	3	2	2	2	2	2	1	2	1	2	2	3	1
3	3	2	2	-	2	2	2	1	2	1	2	2	3	1
4	3	2	3	-	2	2	1	1	2	1	2	2	3	1
5	3	2	-	-	2	2	2	1	2	3	2	3	3	1
CO (W.A)	**3**	**2.4**	**2**	**2**	**2**	**2**	**1.8**	**1**	**1.8**	**1.5**	**2**	**2.2**	**3**	**1**

22MEC02 - ENGINEERING GRAPHICS AND DRAFTING

L	T	P	C
3	0	2	4

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To Create the projection of points, lines and planes	**1.1**	The students will be able to construct the projection of points, lines and planes
2.0	To Develop the projection of Solid	**2.1**	The students will be able to develop projection of solids
3.0	To Solve problems in sectioning of solids and developing the surfaces	**3.1**	The students will be able to solve problems in sections of solids and development of surfaces
4.0	To Apply the concepts of orthographic and isometric	**4.1**	The students will be able to apply the concepts of isometric in engineering practice
5.0	To Draw engineering drawing by Modeling software with dimensions	**5.1**	The students will be able to draw Engineering drawing by Modeling software with dimensions

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 – scales

UNIT I- PROJECTION OF POINTS AND LINES **(9)**

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.

UNIT II - FIRST ANGLE PROJECTION OF PLANE **(9)**

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III - PROJECTION OF SOLIDS **(9)**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to anyone of the principal plane and Parallel to another by rotating object method.

UNIT IV - DEVELOPMENT OF SURFACES **(9)**

Development of lateral surfaces of simple and sectioned solids - prisms, pyramids cylinder and cone.

UNIT V – ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS **(9)**

Principles of isometric projection - isometric scale - isometric projections of lines, plane figures, simple solids and truncated solids - prisms, pyramids, cylinder, cone – free hand sketching of orthographic views from isometric views of objects.

LIST OF THE EXPERIMENTS

1. Computer aided drafting of front and top views of the given isometric view.
2. Computer aided drafting of front and top views of cylinder and cone.
3. Computer aided drafting of sectional views of prism and pyramid.
4. Draw the isomeric projection from given front and top views of the solid model.
5. 3D modeling of prism and pyramid
6. 3D modeling of spur gear.

TOTAL (L:45+P30) : 75 PERIODS

TEXT BOOKS:

1. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 2022.
2. N.S Parthasarathy and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.

REFERENCES:

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.
2. K.R.Gopalakrishna., "Computer Aided Engineering Drawing" (Vol I and II combined) Subhas Stores, Bangalore, 2017.
3. K. V.Natarajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
4. 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.
5. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2nd Edition, 2009.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	-	3	1	-	-	-	2	-	2	-	2
2	3	2	1	-	3	1	-	-	-	2	-	2	-	2
3	3	2	1	-	3	1	-	-	-	2	-	2	-	2
4	3	2	1	-	3	1	-	-	-	2	-	3	-	2
5	3	3	2	-	3	1	-	-	-	2	-	3	-	2
CO (W.A)	**3**	**2.2**	**1.2**	**-**	**3**	**1**	**-**	**-**	**-**	**2**	**-**	**2.4**	**-**	**2**

22GEP01 - ENGINEERING PRACTICES LABORATORY *(Common to AGRI, BME, CHEM, CIVIL, ECE, EEE and MECH Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To provide hands on training on various basic engineering practices in Civil Engineering	1.1	The students will be able to make various joints/ connections in civil engineering practices like plumbing and carpentry.		
2.0	To provide hands on training on welding in Mechanical Engineering	2.1	The students will be able to make various shapes using welding processes.		
3.0	To provide hands on training on various basic engineering practices in Mechanical Engineering	3.1	The students will be able to make various shapes using manufacturing processes like machining and sheet metal work.		
4.0	To understand the basic working principle of electric components	4.1	The students will be able to do residential house wiring and measure electric quantities-Voltage, Current and Power in R Circuit		
5.0	To understand the basic working principle of electronic components	5.1	The students will be able to perform the assembling and testing of the PCB based electronic circuits.		

GROUP-A (MECHANICAL AND CIVIL ENGINEERING)	
I - CIVIL ENGINEERING PRACTICE	**(15)**
Buildings: a. Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects	
Plumbing: a. Study of tools and operations b. Hands-on-exercise: External thread cutting and joining of pipes	
Carpentry: a. Study of tools and operations b. Hands-on-exercise: "L" joint and "T" joint	
II - MECHANICAL ENGINEERING PRACTICE	**(15)**
Welding: a. Study of arc welding, gas welding tools and equipments b. Arc welding- Butt joints, Lap joints and Tee joints c. Practicing gas welding	
Basic Machining: a. Study of lathe and drilling machine b. Facing and turning c. Drilling and Tapping	

Sheet Metal Work:

a. Study of tools and operations
b. Rectangular tray
c. Cone

GROUP - B (ELECTRICAL AND ELECTRONICS)

I - ELECTRICAL ENGINEERING PRACTICE **(15)**

a. Residential house wiring using Switches ,fuse, indicator, lamp
b. Fluorescent lamp wiring
c. Stair Case Wiring
d. Measurement of electrical quantities – Voltage, current ,power in R Circuit
e. Study of Electrical apparatus-Iron box & water heater
f. Study of Electrical Measuring instruments- Megger

II - ELECTRONICS ENGINEERING PRACTICE **(15)**

a. Study of Electronic components and various use of multi meter.
b. Measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
c. Study of logic gates AND, OR, XOR and NOT.
d. Study of Clock Signal.
e. Soldering practice -Components Devices and Circuits - Using general purpose PCB.
f. Study of Half Wave Rectifier (HWR) and Full Wave Rectifier (FWR).
g. Study of Telephone, FM Radio and Cell Phone.

TOTAL (P: 60) = 60 PERIODS

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	-	-	-	-	1	1	1	-	2	1	-
2	3	3	2	-	-	-	-	1	1	1	-	2	1	-
3	3	2	2	-	-	-	-	1	1	1	-	2	1	-
4	3	2	-	-	-	-	-	1	1	1	-	2	1	-
5	3	2	-	-	-	-	-	1	1	1	-	2	1	-
CO (W.A)	**3**	**2.4**	**2**	-	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**2**	**1**	**-**

22CYP01 CHEMISTRY LABORATORY *(Common to AGRI, BME, CHEM, CIVIL, ECE, EEE and MECH Branches)*				
L	**T**	**P**	**C**
0	**0**	**2**	**1**

PRE REQUISITE : NIL

Course Objectives		**Course Outcomes**	
1.0	To explain the origin of hardness, alkalinity, and chloride and dissolved oxygen in water.	1.1	The students will be able to make the student to acquire practical skills in the determination of water quality parameters through volumetric analysis
2.0	To determine the copper in brass in the given solution.	2.1	The students will be able to evaluate the amount of copper in the given analyze by titration method.
3.0	Enable the students to acquire knowledge of conductometric titrations and their calculations.	3.1	The students will be able to gain the knowledge about conductance of ions.
4.0	To perform a potentiometric titration and pH of an acidic solution of known Normality.	4.1	The students will be able to analyze and gain experimental skill about activity of hydrogen ions and measures the voltage
5.0	To know about pH of the solution and how to measure pH using pH meter.	5.1	The students will be able to utilize the fundamental laboratory techniques for analyses such as pH of acidic, basic and neutral solution.

LIST OF EXPERIMENTS

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of DO content of water sample by Winkler's method.
5. Estimation of copper in brass by EDTA.
6. Conductometric titration of strong acid vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Determination of strength of given hydrochloric acid using pH meter.

Total (30 P) = 30 periods

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	-	1	1	1	-	-	-	-	1	1	1	-
2	2	1	-	1	-	1	2	-	-	-	1	1	-	-
3	2	-	-	1	-	1	2	-	-	-	1	1	-	-
4	2	-	-	1	2	1	2	-	-	-	1	1	1	-
5	2	2	-	1		1	2	-	-	-	-	1	-	-
CO (W.A)	**2**	**1**	**-**	**1**	**2**	**1**	**2**	**-**	**-**	**-**	**1**	**1**	**1**	**-**

22MAN01 INDUCTION PROGRAMME
(For Common To All Branches)

	L	T	P	C
	-	-	-	-

PRE REQUISITE : NIL

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

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

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

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

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

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

(i) Physical Activity

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

(ii) Creative Arts

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

(iii) Universal Human Values

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

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would

be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

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

(v) Proficiency Modules

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

(vi) Lectures by Eminent People

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

(vii) Visits to Local Area

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

(viii) Familiarization to Dept./Branch & Innovations

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

(ix) Department Specific Activities

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

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

REFERENCES:

1.Guide to Induction program from AICTE

2MAN02 – SOFT/ANALYTICAL SKILLS – I *(Common to All Branches)*					
			L	**T**	**P**	**C**
PREREQUISITE : NIL			**1**	**0**	**2**	**0**
Course Objectives		**Course Outcomes**			
1.0	To understand the basic concepts of grammar and apply them in a structured manner.	**1.1**	The students will be able to intensify their awareness on correct usage of grammar in writing and speaking		
2.0	To evaluate various real-life situations by resorting to an analysis of key issues and factors.	**2.1**	The students will be able to solve the real-time problems for performing job functions easily.		
3.0	To solve mathematical problems and thereby reducing the time taken for performing job functions.	**3.1**	The students will be able to enhance their aptitude round clearing ability in interview process.		

UNIT I – VERBAL ABILITY	**(5+10)**
Tenses - One word substitution- Articles – Preposition - Conjunction	
UNIT II – BASIC APTITUDE	**(5+10)**
Percentage – Ratio and Proportion – Blood Relations – Analogy	
UNIT III – LOGICAL REASONING	**(5+10)**
Probability – Profit and Loss - Syllogism - Statement Assumptions.	
TOTAL(L :15,P:30) : 45 PERIODS	

REFERENCES:

1. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", Fourth Edition, Cambridge University 2012.

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	3	3	-	2	1	-
2	-	3	2	2	-	-	1	-	2	-	-	3	1	-
3	-	3	2	2	-	-	1	-	2	-	-	3	1	-
CO (W.A)	**-**	**2**	**1.3**	**1.3**	**-**	**-**	**0.6**	**-**	**2.3**	**1**	**-**	**2.6**	**1**	**-**

22MAN03 YOGA - I *(For Common To All Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**I**	**0**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To make students in understanding the importance of yoga in shaping mental and physical wellness.	**1.1**	Student will be able to understand the importance of yoga for physical and mental goodness.		
2.0	To provide awareness about the significance of leading a peaceful life by following yoga exercises and principles.	**2.1**	Student will be able to perform the yoga exercises for hand, leg, eye and sun salutation etc.		
3.0	To develop mental wellbeing through meditation and breathing exercises.	**3.1**	Student will be able to learn and practice meditation techniques for keeping good mental health		
4.0	To strengthen the body through physical exercises.	**4.1**	Student will be able to develop their body by performing yoga exercises.		
5.0	To inculcate the knowledge about different types of Asanas and their benefits	**5.1**	Students will be able to demonstrate different types of yoga Asanas for improving their personal fitness.		

UNIT I – INTRODUCTION TO YOGA	**(9)**
Meaning and Importance of Yoga - Elements of Yoga - Introduction - Asanas, Pranayama, Meditation and Yogic Kriyas - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana and Shashankasana) - Relaxation Techniques for improving concentration - Yog-nidra.	
UNIT II - YOGA AND LIFE STYLE	**(9)**
Asanas as Preventive measures – Hypertension:Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana – Obesity: Procedure, Beneits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana – Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana - Diabetes: Procedure, Benefits and contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana – Asthema: Procedure, Benfits and contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.	
UNIT III – MIND EXERCISES	**(9)**
Naadi sudhi – Thanduvada sudhi – Breathing meditation – Silent meditation – Relax meditation.	
UNIT IV – PHYSICAL EXERCISES (PART– I)	**(9)**
Hand Exercises – Leg Exercises – Eye Exercises – Sun Salutation.	
UNIT V – ASANAS (PART-I)	**(9)**
Asanas –Tadasana – Yegapadhasana – Chakrasana – Udkaddasana – Thirikosana – Thandasana – Paschimottanasana.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS/REFERENCES:
1. Light On Yoga by B.K.S. Iyengar.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						2	2	3	2	2		3		
2						2	2	3	2	2		3		
3						2	2	3	2	2		3		
4						2	2	3	2	2		3		
5						2	2	3	2	2		3		
CO (W.A						2	2	3	2	2		3		

22EYA02 - PROFESSIONAL COMMUNICATION - II (*Common to All Branches*)					
		L	**T**	**P**	**C**
		2	**0**	**2**	**3**
PREREQUISITE : 22EYA01					
Course Objectives		**Course Outcomes**			
1.0	To familiarize the students with the basic structures of English and to train them to use these elements correctly in speaking and writing	**1.1**	The Students will be able to frame sentences both in written and spoken forms with accuracy and fluency.		
2.0	To acquire proficiency in LSRW skills on par with the expectations of the industry.	**2.1**	The Students will be able to attain and enhance competence in the four modes of literacy: Listening, Speaking, Reading and Writing.		
3.0	To enable students to adopt strategies for enhancing vocabulary, language and fluency and to deliver professional presentations.	**3.1**	The Students will be able to gain essential competency to express one's thoughts orally and in writing in a meaningful way.		
4.0	To communicate effectively in an academic setting using the language skills as tools.	**4.1**	The students will be able to use linguistic structures to read and understand well-structured texts encountered in academic or social contexts.		
5.0	To acquire necessary language skills to follow and comprehend discourse such as lectures, conversations, interviews, and discussions.	**5.1**	The Students will be able to perform various tasks, such as role plays, debates, group discussions apart from the use of correct spelling and punctuation		

UNIT I – LANGUAGE RUDIMENTS	**(6+6)**
Grammar – Active and Passive Voice – Impersonal Passive Voice – Numerical Expressions - **Listening** – Listening for Specific Information and Match / Choose / Fill in the texts - **Speaking** – Describing a Person - Making Plans -**Reading** – Intensive Reading -**Writing** – Job Application with Resume	
UNIT II - RHETORIC ENHANCERS	**(6+6)**
Grammar – Reported Speech – Infinitive and Gerund - **Listening** – Listening to Iconic Speeches and making notes - Listening news / documentaries - **Speaking** –Talking over Phone – Narrating Incidents - **Reading** – Extensive Reading (Motivational Books) - **Writing** – Recommendation	
UNIT III – TECHNICAL CORRESPONDENCE	**(6+6)**
Grammar – If Conditionals – Blended Words - **Listening** – Listening to business conversation on audio and video of Short Films, News, Biographies - **Speaking** – Synchronous communication and Asynchronous communication - Opportunities and threats in using digital platform- **Reading** - Finding key information in a given text - **Writing** –Netiquettes- Inviting Dignitaries - Accepting & Declining Invitation	

UNIT IV - CORPORATE COMMUNICATION	(6+6)
Grammar – Concord – Compound Words - **Listening** – Listening to Roles and Responsibilities in Corporate - Listening to technical videos - **Speaking** – Introduction to Technical Presentation - Story Telling - **Reading** – Reading and Understanding Technical Articles - **Writing** – Report Writing (Accident, Survey and feasibility)	
UNIT V - LANGUAGE BOOSTERS	**(6+6)**
Grammar - Idiomatic Expressions – Relative Clauses – Confusable words - **Listening** – Listening to different kinds of Interviews - Listening to Group Discussion - **Speaking** – Group Discussion - **Reading** – Reading and Interpreting Visual Materials - **Writing** – Analytical Paragraph Writing	
LIST OF SKILLS ASSESSED IN THE LABORATORY 1. Grammar. 2. Listening Skills. 3. Speaking Skills. 4. Reading Skills 5. Writing Skills	
TOTAL (L:30 , P:30) = 60 PERIODS	

TEXT BOOKS:

1. Sudharshana, N.P and Saveetha.C, "English for Technical Communication", Cambridge University Press, New Delhi, 2016 (Reprint 2017).

REFERENCES:

1. Rizvi, M Ashraf, "Effective Technical Communication", Second Edition, McGraw Hill Education India Pvt Ltd, 2017.
2. Rodney Huddleston, Geoffrey K. Pullum and Brett Reynolds, "A Student's Introduction to English Grammar", Second Edition, Cambridge University Press, New Delhi, 2022

WEB REFERENCE:

1. http://youtu.be/URtdGiutVew

Mapping of COs with POs / PSOs														
Cos	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3	3		2	1	
2									3	3		2	1	
3									3	3		2	1	
4									3	3		2	1	
5									3	3		2	1	
CO									**3**	**3**		**2**	**1**	

22MYB02–PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES *(Common to AGRI,CIVIL.CHEM, MECH Branches)*					
			L	**T**	**P**	**C**
			3	**I**	**0**	**4**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To understand the concept of Fourier series and enhance the problem solving skills.	**1.1**	The students will be able to analysis the Fourier series problem		
2.0	To acquire knowledge of Partial Differential Equations.	**2.1**	The students will be able to know the formation of partial differential equations and types of solutions.		
3.0	To solve different forms of wave and heat equations	**3.1**	The students will be able to apply the partial differential equations to solve boundary value problems.		
4.0	To gain the concepts of Fourier transform techniques used in wide variety of situations.	**4.1**	The students will be able to solve the problems using Fourier transforms and convolution theorem technique.		
5.0	To apply the concepts of Laplace transforms & its applications to various problems related to Engineering	**5.1**	The students will be able to simplify calculations in system modeling		

UNIT I – FOURIER SERIES	**(9+3)**
Dirichlet's condition – Fourier series: Half range sine series – Half range cosine series – Parseval's identity for half range series – Root mean square value of a function – Harmonic analysis.	
UNIT II –PARTIAL DIFFERENTIAL EQUATIONS	**(9+3)**
Formulation of partial differential equations by eliminating arbitrary constants and functions – Solution of standard types first order partial differential equations of the type f(p,q)=0,Clairaut's form – Lagrange's linear equations –Linear partial differential equation of second and higher order with constant coefficient of homogeneous types.	
UNIT III –APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	**(9+3)**
Classification of second order quasi linear partial differential equations – Solution of one dimensional wave equation (Zero and non-zero velocity) – One dimensional heat equation (Temperature reduced to zero and non zero boundary conditions) – Steady state solution of two dimensional heat equation(Finite and infinite plate).	
UNIT IV –-FOURIER TRANSFORM	**(9+3)**
Fourier integral theorem(Statement only) – Fourier transform pair - Sine and Cosine transforms – Properties -Transforms of simple functions – Convolution theorem – Parseval's identity(Excluding proof).	
UNIT V –LAPLACE TRANSFORM	**(9+3)**
Condition for existence - Transforms of Elementary functions –Basic Properties- First & Second Shifting Theorems(Statement only) - Initial and Final value Theorems. Inverse Laplace transforms -Convolution theorem (Excluding proof)- Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform.	
TOTAL (L:45+T:15) :60 PERIODS	

TEXT BOOKS:

1. Veerajan.T," Engineering Mathematics (for semester III), 3rd ed., Tata Mc Graw Hill, New Delhi.
2. Kandasamy.P, Thilagavathy.K, and Gunavathy.K., "Engineering Mathematics; Volume III", S.Chand& Co Ltd., 2008.
3. Grewal B.S, "Higher Engineering Mathematics", 42nd ed., Khanna publishers, New Delhi, 2012.

REFERENCES:

1. Goyal Manish and Bali.N.P,"A Text book of Engineering mathematics", 6th ed.,Laxmi Publication (P) Ltd,New Delhi, 2012.
2. Kreyszig, Erwin, "Advanced Engineering Mathematics", 9th ed., Wiley Publications, New Delhi, 2006.
3. Singaravelu.A,"Transforms and Partial Differential Equations", Reprint Edition 2013, Meenakshi Publications, Tamilnadu.

WEB REFERENCES:

1. https://youtu.be/HCHnXuQ2oME
2. https://www.youtube.com/watch?v=LYsIBqjQTdI&list=PLF6061160B55B0203&index=1
3. https://www.youtube.com/watch?v=9DgiyiRNw1g
4. https://youtu.be/IkAvgVUvYvY
5. https://www.youtube.com/watch?v=8oE1shAX96U&list=PLnVYEpTNGNtVH5YLVJsA2WxWXk6bAps-D&index=1

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1					1	1		2		
2	3	2	1	1					1	1		2		
3	3	2	1	1					1	1		2		
4	3	2	1	1					1	1		2		
5	3	2	1	1					1	1		2		
CO (W.A)	3	2	1	1					1	1		2		

22PYB04 - PHYSICS FOR MECHANICAL ENGIINEERING (Mechanical Engineering)				
	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To expose the concepts of properties of matter.	1.1	Predict the importance of properties of matter in the field of mechanical engineering.
2.0	To identity knowledge of fundamental concepts of thermal physics.	2.1	Gain the importance of fundamental concepts of thermal physics.
3.0	To update the knowledge about the elements of thermodynamics.	3.1	Understand the basics of elements of thermodynamics.
4.0	To identify knowledge in the field of electromagnetic theory.	4.1	Recognize the importance of electromagnetic theory.
5.0	To obtain the knowledge of optics and laser.	5.1	Acquire knowledge about optics, laser and their applications.

UNIT I – PROPERTIES OF MATTER	**(9)**
Elasticity – Hooke's law Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.	
UNIT II – THERMAL PHYSICS	**(9)**
Mode of heat transfer-thermal conductivity - Newton's law of cooling - thermal conduction through compound media (bodies in series and parallel) - thermal conductivity of a good conductor – Forbe's method-thermal conductivity of bad conductor - Lee's disc - radial flow of heat-expression for thermal conductivity of rubber - experimental determination - practical applications of conduction.	
UNIT III – ELEMENTS OF THERMODYNAMICS	**(9)**
Concept of temperature – Heat - Thermodynamics - work – Heat in Thermodynamics – Comparison of heat and work – internal energy - first law of thermodynamics – applications of first law - second law of thermodynamics – the Carnot engine – heat engine – heat pump refrigerator -Third law of thermodynamics.	
UNIT IV – ELECTRO MAGNETIC THEORY	**(9)**
Force on a moving Charge - Force on a differential Current Element - Force & Torque Magnetisation & Permeability - Magnetic Boundary Conditions -Inductance & Mutual Inductance - Time Varying Fields: Faraday's Law - Displacement Current - Maxwell's Equation.	
UNIT V – OPTICS AND LASERS	**(9)**
Interference: Air wedge – theory – uses – testing of flat surfaces – determination of thickness of a thin wire – Introduction of laser - Properties of laser beams : mono - chromaticity, coherence, directionality and Intensity - Einstein's A and B coefficients derivation - Resonant cavity - Types of lasers – solid state laser (Neodymium) – Gas laser (CO_2) – Materials processing – Laser Cutting – Drilling – Welding – Soldering – Industrial Applications.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2019.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2017.
3. A. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2019.

REFERENCES

1. Dattuprasad and Ramanlal Joshi, "Engineering Physics" Tata McGraw hill education, 2016.
2. Subrahmanyam N, Brijlal, "A Text Book of Optics" S.Chand & Co. Ltd, New Delhi, 2017.
3. M.N.Avathanalu, P.G.Kshirsagar "A text book of engineering physics" S.Chand &company Ltd, 2015.

WEB LINKS

1. https://bayanbox.ir/view/7764531208313247331/Kleppner-D.-Kolenkow-R.J.-Introduction-to-Mechanics-2014.pdf.
2. https://physicaeducator.files.wordpress.com/2017/11/electricity_and_magnetism-by-purcell-3ed-ed.pdf.
3. https://rajeshvcet.home.blog/regulation-2021/ph3151-engineering-physics-study-materials/
4. https://zenodo.org/record/243407#.ZEgPZXZBzIU
5. https://farside.ph.utexas.edu/teaching/qmech/qmech.pdf.
6. https://web.pdx.edu/~pmoeck/phy381/workbook%20nanoscience.pdf.

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

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	-	-	-	-	-	1	1	-	2	-	-
2	3	2	3	-	-	-	-	-	1	1	-	1	-	-
3	3	2	3	-	-	-	-	-	1	1	-	2	-	-
4	2	2	2	-	-	-	-	-	-	-	-	1	-	-
5	2	1	2	-	-	-	-	-	1	1	-	2	-	-
CO (W.A)	**3.0**	**2.0**	**3.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**2.0**	**0.0**	**0.0**

22CSC01 - PROBLEM SOLVING AND C PROGRAMMING *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To understand problem solving, problem solving aspects, programming and to know about various program design tools.	**1.1**	The student will be able to identify the appropriate problem solving techniques to drive the solution for the given problem.		
2.0	To learn basic structure and Control Statements in C programming.	**2.1**	The student will be able to implement the appropriate looping and control statements in C for developing applications.		
3.0	To learn the manipulation of arrays and strings	**3.1**	The student will be able to develop programs on arrays of different dimensions of arrays and strings concepts.		
4.0	To understand the concept of modular programming using user defined functions.	**4.1**	The student will be able to implement programs using user defined functions.		
5.0	To acquaint with the use and benefits of Memory Allocation and file handling.	**5.1**	The student will be able to use dynamic memory allocation functions for assigning memory space during execution.		

UNIT I -PROBLEM SOLVING AND C PROGRAMMING BASICS	**(9)**
General Problem Solving: Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms **Basics of C Programming** : Introduction to C - Structure of C program - Programming Rules – Compilation – Errors - C Declarations: Tokens - keywords - identifiers - constants - data types - variable declaration and initialization - type conversion - constant and volatile variables - operators and expressions.	
UNIT II - DECISION CONTROL STATEMENTS	**(9)**
Managing Input and Output operations, Decision Control Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops break and continue statements.	
UNIT III - ARRAYS AND STRINGS	**(9)**
Introduction to Array - Definition - Array initialization - Characteristics - One Dimensional Array - Array operations -Two dimensional arrays -Strings and String handling functions.	
UNIT IV - FUNCTIONS	**(9)**
Functions: Basics - definition - Elements of User defined Functions - return statement, Function types, Parameter Passing Techniques, Function returning more values - Passing Array to Functions - Recursion - Storage classes.	
UNIT V - POINTERS AND FILE MANAGEMENT	**(9)**
Pointer concepts - Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C- Dynamic Memory Allocation	
	TOTAL (L:45) :45 PERIODS

TEXT BOOKS:

1. Ashok N. Kamthane, "Programming in C", 2nd Edition, Pearson Education, 2013.
2. Sumitabha Das, "Computer Fundamentals and C Programming", 1st Edition, McGraw Hill, 2018.

REFERENCES:

1. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st Edition, ISBN10: 8131705625, ISBN-13: 978-8131705629
2. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th Edition, India, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645
3. Yashavant Kanetkar, "Let us C", 16th Edition, BPB Publications, 2018.
4. ReemaThareja., "Programming in C ", 2nd Edition, Oxford University Press, New Delhi, 2018.
5. Balagurusamy E., "Programming in ANSI C", 7th Edition, Mc Graw Hill Education, 2017.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	-	-	-	-	-	-	-	3	3	3
2	3	2	3	-	-	-	-	-	-	-	-	3	3	3
3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
4	3	2	3	-	-	-	-	-	3	-	3	3	3	3
5	3	2	3	-	-	-	-	-	-	-	3	3	3	3
CO (W.A)	3	2	3	-	-	-	-	-	3	-	3	3	3	3

22ECC03 BASICS OF ELECTRONICS AND INSTRUMENTATION ENGINEERING *(For MECH Branch only)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To learn the basic knowledge on basic electric laws and basic of electronics.	**1.1**	The students will be able to explain the basic knowledge on basic electric laws and basic of electronics.		
2.0	To impart knowledge on the principles of working of semi-conductor circuits and its characteristics.	**2.1**	The students will be able to understand the principles of working of the semiconductor circuits and its characteristics.		
3.0	To introduce the fundamentals of digital electronics.	**3.1**	The students will be able to expose the concept of digital electronics.		
4.0	To expound the working principles of measuring instruments.	**4.1**	The students will be able to explain different measuring instruments.		
5.0	To expound the working principles of indicating instruments.	**5.1**	The students will be able to choose appropriate instruments for indicating different measurements for a specific application.		

UNIT I - BASICS OF ELECTRONICS	**(9)**
Ohm's law - Kirchhoff's law - Power: real, reactive and apparent - Power factor - Electrical circuit elements(R, L, C) series and parallel circuits - Voltage and current sources - Representation of sinusoidal waveforms- Peak and RMS values- semiconductors-intrinsic, extrinsic, energy band diagram.	
UNIT II - SEMICONDUCOR CIRCUITS	**(9)**
PN junction Diode - forward bias, reverse bias, drift and diffusion current - Rectifier: Half wave, full wave and bridge rectifier - Transistor: PNP, NPN transistor – Operational amplifier: inverting and non-inverting amplifier.	
UNIT III - DIGITAL ELECTRONICS	**(9)**
Number system: binary, octal, decimal and hexadecimal – Boolean algebra theorems – Logic gates - Flip-flops and types (diagram and truth table) – register and counter (types).	
UNIT IV - MEASURING INSTRUMENTS	**(9)**
Sensors: static and dynamic characteristics – Transducer – Piezo electric, resistive, inductive, capacitive, thermo electric, photo electric and LVDT.	
UNIT V - INDICATING INSTRUMENTS	**(9)**
Types of indicating instruments: moving coil and moving iron - Error analysis: electrical, mechanical, thermal, optical, biological and chemical classification of errors – Oscilloscopes - Multimeters and Voltmeters.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. S.Salivahanan, N.Suresh kumar and A.Vallavanraj, "Electronic Devices and Circuits", Tata McGraw Hill, 3rd Edition(2013).
2. Morris Mano M and Michael D.Clletti, "Digital Design", IV Edition, Pearson Education, 2008
3. Patranabis.D, "Sensor and Transducer", Prentice Hall of India(Pvt)Ltd., 2013.
4. R.Muthusubramanian, S.Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw Hill, Nineteenth reprint(2015).

REFERENCES:

1. J.B.Gupta, "Electronic Devices and Circuits", S.K.Kataria and Sons, 2009.
2. D.P.Leach, A.P.Malvino, "Digital Principles and Applications",TMH,2010

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	-	-	-	-	1	-	-	-	1	-	-	-
2	1	-	-	-	-	-	-	-	-	1	2	-	-	-
3	2	2	1	2	-	-	-	-	-	1	2	-	-	-
4	-	1	-	-	-	-	-	-	-	2	2	1	-	2
5	2	-	2	-	2	2	1	-	-	-	1	-	-	-
CO (W.A)	**1.4**	**1**	**0.6**	**0.4**	**0.4**	**0.4**	**0.2**	**0**	**0**	**0.8**	**1.6**	**0.2**	**-**	**0.4**

22MEC03 ENGINEERING MECHANICS (Mechanical Engineering Branch only)					
		L	**T**	**P**	**C**
		2	**1**	**0**	**3**
PRE REQUISITE :					
Course Objectives		**Course Outcomes**			
1.0	To acquire knowledge on the behaviour of a particle under the action of forces	**1.1**	The students will be able to solve the engineering problems on resultant forces and particles under equilibrium conditions.		
2.0	To analyze the behaviour of the rigid body under the action of forces	**2.1**	The students will be able to calculate the reaction forces of various supports and resultant forces on rigid bodies		
3.0	To gain knowledge related to friction and simple contact friction	**3.1**	The students will be able to solve the problems involving dry friction of simple sliding systems and simple contact friction.		
4.0	To introduce the geometric properties of the different surfaces.	**4.1**	The students will be able to determine the centroid, centre of gravity and moment of inertia of various surfaces.		
5.0	To acquire knowledge work, energy and momentum related to dynamics of particles	**5.1**	The students will be able to solve the problems involving dynamics of particles.		

UNIT I - STATICS OF PARTICLE	**(6+3)**
Units and dimensions - fundamental principles - laws of mechanics, lami's theorem, parallelogram and triangular law of forces, principle of transmissibility – system forces - statics of particles in two dimensions - resultant force - coplanar concurrent forces - Free body diagram - equilibrium of particles in two dimensions.	
UNIT II - STATICS OF RIGID BODY	**(6+3)**
Statics of rigid body in two dimensions - rigid body - moment of a force about a point - varignon's theorem - resultant force for coplanar parallel and nonconcurrent forces - moments and couples - equilibrium of rigid bodies in two dimensions - requirements of stable equilibrium - types of supports and their reactions.	
UNIT III - FRICTION	**(6+3)**
Frictional force – limiting friction - angle of repose - coulomb's law of dry friction - cone of friction - problems involving the equilibrium analysis of simple systems with sliding friction - simple contact friction - ladder friction - belt friction.	
UNIT IV - PROPERTIES OF SECTIONS	**(6+3)**
Centroid – centre of gravity- Theorems of Pappus and Guldinus – moment of inertia of plane areas - transfer theorems - parallel axis and perpendicular axis theorem- radius of gyration- product of inertia - polar moment of inertia - principal axes and principal moment of inertia of plane areas.	
UNIT V - DYNAMICS OF PARTICLES	**(6+3)**
Kinematics - Displacements, velocity and acceleration, their relationship -rectilinear motion - curvilinear motion - projectile motion. Kinetics - Newton's law – D'Alembert's principle - impact of elastic bodies.	
TOTAL (L:30+T:15): 45 PERIODS	

TEXT BOOK:

1. Ferdinand P. Beer and E. Russell Johnson, "Vector Mechanics for Engineers: Statics and Dynamics", 12th ed., Tata McGraw Hill International Edition, 2019

REFERENCES:

1. Irving H. Shames, "Engineering Mechanics : Statics and Dynamics", Prentice Hall of India Private limited, 2006
2. Russell C Hibbeler, "Engineering Mechanics: Statics and Dynamics", 14th ed., Prentice Hall, 2016
3. Anthony M. Bedford and Wallace Fowler, "Engineering Mechanics: Statics and Dynamics", 5th ed., Prentice Hall, 2008
4. Palanichamy, M.S and Nagan,S, "Engineering Mechanics - Statics and Dynamics", 3rd ed., Tata McGraw-Hill, New Delhi, 2005
5. Meriam.J.L , Kraige.L.G, and Boltan, J.N "Engineering Mechanics: Statics and Dynamics", 9th ed., Wiley Publishers, 2020
6. Rajasekaran.S and Sankarasubramanian.G, "Fundamentals of Engineering Mechanics", 3rd ed., vikas Publishing House Pvt.Ltd. New Delhi, 2005.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	-	-	-	2	-	-	-	-	2	3	-
2	3	1	2	-	-	-	2	-	-	-	-	2	3	-
3	2	1	2	-	-	-	2	-	-	-	-	2	3	-
4	2	1	2	-	-	-	2	-	-	-	-	2	3	-
5	2	1	2	-	-	-	2	-	-	-	-	2	3	-
CO (W.A)	**2.4**	**1**	**2**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**2**	**3**	**0**

22CSP01 - PROBLEM SOLVING AND C PROGRAMMING LABORATORY *(Common to All Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**4**	**2**
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language.	**1.1**	The student will be able to identify the appropriate programming construct to develop programs for all types of problems.		
2.0	To study, analyze and implement the concepts of arrays and strings in C programming.	**2.1**	The student will be able to implement programs on arrays of different dimensions and string concepts.		
3.0	To learn the importance user defined functions and pointers.	**3.1**	The student will be able to develop programs using user defined functions and pointers.		
4.0	To gain knowledge in user defined data types and file handling functions in C programming	**4.1**	The student will be able to design programs using user defined data types and various file handling functions.		
5.0	To acquire skill in dynamic memory allocation	**5.1**	The student will be able to use dynamic memory allocation functions for assigning memory space during execution.		

C-Programming:

1. Draw the flowchart for the following using Raptor tool.
    a) Simple interest calculation
    b) Greatest among three numbers
    c) Find the sum of digits of a number
2. Programs for demonstrating the use of different types of operators like arithmetic, logical, relational and ternary operators (Sequential and Selection structures)
3. Programs for demonstrating repetitive control statements like 'for', 'while' and 'do-while' (Iterative structures)
4. Programs for demonstrating one-dimensional and two-dimensional numeric array
5. Programs to demonstrate modular programming concepts using functions
6. Programs to implement various character and string operations with and without built-in library functions.
7. Programs to demonstrate the use of pointers
8. Programs to illustrate the use of user-defined data types
9. Programs to implement various file management.
10. Program Using Dynamic memory allocation functions

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:
Hardware: • LAN System with 33 nodes (OR) Standalone PCs – 33 Nos. • Printers – 3 Nos. **Software:** • RAPTOR Tool • Compiler – C
TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	-	-	-	-	-	-	-	3	3	3
2	3	2	3	-	-	-	-	-	-	-	-	3	3	3
3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
4	3	2	3	-	-	-	-	-	3	-	3	3	3	3
5	3	2	3	-	-	-	-	-	-	-	3	3	3	3
CO (W.A)	3	2	2	-	-	-	-	-	3	-	3	3	3	3

22PYP01 - PHYSICS LABORATORY (Common to All Branches)					
		L	**T**	**P**	**C**
		0	**0**	**2**	**1**
PREREQUISITES: NIL					
Course Objectives		**Course Outcomes**			
1.0	To provide the basic practical exposure to all the engineering and technological streams in the field of physics.	1.1	The students will be able to apply the concept of stress, strain and elastic limit for a given sample to find their properties.		
2.0	To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.	2.1	The students will be able to gain the basic knowledge about handling the laser light and Identify the basic parameters of an optical fibre.		
3.0	To enable the students to correlate the theoretical principles with application oriented studies.	3.1	The students will be able to analyze the properties of matter with sound waves.		
4.0	To introduce different experiments to test basic understanding of physics concepts applied in optics and electronics	4.1	The students will be able to recall the knowledge of properties of light through spectrometer grating and fiber optic cable.		
5.0	To analyze the behavior and characteristics of solar cells and LED	5.1	The students will be able to acquire the knowledge in semiconducting devices such as solar cells and LED.		

PHYSICS LABORATORY (Any Five)

1. Determination of Young's modulus by non-uniform bending method
2. Determination of (a) wavelength and (b) particle size using Laser.
3. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of band gap of a semiconductor.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of V-I characteristics of solar cell.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	-	-	-	-	-	-	1	-	3	3	3
2	3	3	2	-	-	-	-	-	-	-	-	2	3	2
3	3	3	2	-	-	-	-	-	1	-	-	2	3	3
4	3	2	3	-	-	-	-	-	-	-	-	3	2	3
5	3	2	2	-	-	-	-	-	-	1	-	3	2	2
CO (W.A)	**3.0**	**2.0**	**2.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**2.6**	**2.6**	**2.6**

22MAN04- SOFT/ANALYTICAL SKILLS – II *(Common to All Branches)*					
		L	**T**	**P**	**C**
PREREQUISITE : 22MAN02		**1**	**0**	**2**	**0**
Course Objectives		**Course Outcomes**			
1.0	To acquire satisfactory competency in use of verbal reasoning	**1.1**	The students will be able to enhance their vocabulary which in turn will be helpful in developing their speaking skills.		
2.0	To develop skill to meet the competitive examinations for better job opportunity.	**2.1**	The students will be able to solve the problems easily by using Short-cut method with time management.		
3.0	To enrich their knowledge and to develop their logical reasoning thinking ability.	**3.1**	The students will be able to analyze the problems logically and approach the problems in a different manner.		

UNIT I – VERBAL COMPETENCY	**(5+10)**
Voice - Modal Verbs – Synonyms & Antonyms - Confusable Words	
UNIT II – NUMERICAL REPRESENTATION	**(5+10)**
Average – Data Interpretation – Simple Interest and Compound Interest – Venn Diagram.	
UNIT III - RESOLUTION TENDENCY	**(5+10)**
Time and Work – Pipes and Cistern – Number Series and Odd man Out – Cube Problems.	
TOTAL(L :15,P:30) : 45 PERIODS	

REFERENCES:

1. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
2. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", Fourth Edition, Cambridge University 2012.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	3	3	-	2	1	-
2	-	3	2	2	-	-	-	-	2	-	-	3	1	-
3	-	3	2	2	-	-	-	-	2	-	-	3	1	-
CO	**-**	**2**	**1.3**	**1.3**	**-**	**-**	**-**	**-**	**2.3**	**1**	**-**	**2.6**	**1**	**-**

22MAN05 YOGA - II *(For Common To All Branches)*					
		L	**T**	**P**	**C**
		0	**0**	**I**	**0**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To contribute to building a peaceful and better world by educating youth through sport practiced in accordance with Olympism and its values.	**1.1**	Students will be able to Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.		
2.0	To learn different postures associated with physical games.	**2.1**	Students will be able to Assess current personal fitness levels.		
3.0	To learn how to make basic plan for any activity or task.	**3.1**	Students will be able to Improve personal fitness through participation in sports activities.		
4.0	To have an understanding about the basics of sport psychology	**4.1**	Students will be able to Develop understanding of psychological problems associated with the age and lifestyle.		
5.0	To Utilize a thorough knowledge and understanding of Sports Medicine and relevant applied sciences to maintain standards of best practice in prevention and treatment of sports related injuries.	**5.1**	Students will be able to Demonstrate an understanding of sound nutritional practices as related to health and physical performance.		

UNIT I – OLYMPIC MOVEMENT	**(3)**
Ancient & Modern Olympics (Summer & Winter) - Olympic Symbols, Ideals, Objectives & Values - Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.).	
UNIT II – POSTURES	**(3)**
Meaning and Concept of Postures - Causes of Bad Posture - Advantages & disadvantages of weight training - Concept & advantages of Correct Posture - Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis - Corrective Measures for Postural Deformities	
UNIT III – TRAINING AND PLANNING IN SPORTS	**(3)**
Meaning of Training - Warming up and limbering down - Skill, Technique & Style - Meaning and Objectives of Planning - Tournament – Knock-Out, League/Round Robin & Combination.	
UNIT IV – PSYCHOLOGY AND SPORTS	**(3)**
Definition & Importance of Psychology in Physical Edu. & Sports - Define & Differentiate Between Growth & Development - Adolescent Problems & Their Management - Emotion: Concept, Type & Controlling of emotions - Meaning, Concept & Types of Aggressions in Sports - Psychological benefits of exercise - Anxiety & Fear and its effects on Sports Performance - Motivation, its type & techniques - Understanding Stress & Coping Strategies.	

UNIT V – SPORTS MEDICINE	(3)
Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc. History of the Game/Sport – Latest General Rules of the Game/Sport – Specifications of Play Fields and Related Sports Equipment – Important Tournaments and Venues – Sports Personalities – Proper Sports Gear and its Importance.	
TOTAL (L:15) : 15 PERIODS	

TEXT BOOKS/REFERENCES:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes).

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						1	2	3	3	2	1	3		
2						1	2	3	3	2	1	3		
3						1	2	3	3	2	1	3		
4						1	2	3	3	2	1	3		
5						1	2	3	3	2	1	3		
CO (W.A)						**1**	**2**	**3**	**3**	**2**	**1**	**3**		

22MYB03 – STATISTICS AND NUMERICAL METHODS *(Common to Mech, Civil, Agri, Chemical Branches)*				
L	**T**	**P**	**C**
3	**1**	**0**	**4**

PRE REQUISITE :

Course Objectives		**Course Outcomes**	
1.0	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.	**1.1**	The students will be able to select a hypothesis testing method for the given numerical set of data to analyze the significance.
2.0	To understand the knowledge of design of experiments	**2.1**	The students will be able to apply analysis of Variance for the data set of selected number factors for analyzing the significance.
3.0	To introduce the basic concepts of solving algebraic and transcendental equations.	**3.1**	The students will be able to solve an algebraic or transcendental equation using an appropriate numerical method.
4.0	To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in Engineering and technology disciplines.	**4.1**	The students will be able to appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for Engineering problems.
5.0	To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.	**5.1**	The students will be able to solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with Engineering applications.

UNIT I - TESTING OF HYPOTHESIS	**(9+3)**
Sampling Distributions-Tests for single mean, difference of means (Large and Small samples) Using z, t -distribution, F – distribution- Chi-square - Test for independence of attributes and Goodness of fit.	
UNIT II - DESIGN OF EXPERIMENTS	**(9+3)**
Analysis of variance- Completely randomized design - Randomized block design - Latin square design.	
UNIT III - SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	**(9+3)**
Solution of algebraic and transcendental equations - Fixed point iteration method - Newton Raphson method- Solution of linear system of equations Gauss elimination method – Iterative methods of Gauss Jacobi and Gauss Seidel Methods- Eigen values of a matrix by Power method.	
UNIT IV - INTERPOLATION AND APPROXIMATION	**(9+3)**
Lagrange's and Newton's divided difference interpolations - Newton's forward and backward difference interpolation - Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules - Romberg's Methods.	
UNITV - NUMERICAL DIFFERENTIATION AND INTEGRATION	**(9+3)**
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.	
TOTAL (L:45+T:15) : 60 PERIODS	

TEXT BOOK:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.

WEB REFERENCES:

1. https://youtu.be/zmyh7nCjmsg
2. https://youtu.be/NmgbFJ4UwPs
3. https://youtu.be/RgKy7URFx1c
4. https://archive.nptel.ac.in/courses/111/107/111107105/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	1	1	1				1	1		2		
2	3	3	1	1	1				1	1		2		
3	3	2	1	1	1				1	1		2		
4	3	3	1	1	1				1	1		2		
5	3	2	1	1	1				1	1		2		
CO (W.A)	**3**	**3**	**1**	**1**	**1**				**1**	**1**		**2**		

22MEC04 - ENGINEERING THERMODYNAMICS
(Use of Steam Tables and Psychrometric Chart permitted)

L	T	P	C
2	1	0	3

PREREQUISITE : NIL

Course Objectives		Course Outcomes	
1.0	To teach the basic concept of thermodynamics and applications of first law of thermodynamics	1.1	Describe the concepts of conservation of mass, conservation of energy, work interaction, heat transfer and first law of thermodynamics
2.0	To introduce the concept of second law of thermodynamics and entropy	2.1	Apply the concept of second law to analyze the performance of thermal equipments
3.0	To teach steps involved in analysis of gas power cycles	3.1	Determine the performance characteristics of air standard cycles
4.0	To provide knowledge on the process of steam formation at various conditions	4.1	Explain the stages in steam formation and determine the properties of steam
5.0	To impart the knowledge in Psychrometry and Psychrometric processes	5.1	Analyze the Psychrometric processes and determine the properties of air

UNIT I : BASIC CONCEPT, ZEROTH AND FIRST LAW OF THERMODYNAMICS **(6+3)**

Definitions - Thermodynamic systems - thermodynamic equilibrium - properties, state, process and cycle - point and path function - Zeroth law - reversible and Irreversible processes - energy, work and heat - internal energy - First Law - energy as a property of a system - PMM 1 - application of first law to closed system and steady Flow processes - applications of steady flow energy equation - steam turbine, centrifugal compressor, nozzle - limitations of first law.

UNIT II : SECOND LAW OF THERMODYNAMICS AND ENTROPY **(6+3)**

Second Law - performance of heat engines and reversed heat engines - reversible processes - statements of Second Law - PMM 2 - Clausius inequality - Carnot cycle - Carnot's theorem and corollary - entropy as a property of a system - entropy and irreversibility - entropy changes for a closed system and open system - Third Law of Thermodynamics.

UNIT III : GAS POWER CYCLES **(6+3)**

Air standard efficiency - Otto cycle - Diesel cycle - dual combustion cycle - Brayton cycle - work ratio - pressure ratio for maximum work - calculation of air standard efficiency.

UNIT IV : PROPERTIES OF PURE SUBSTANCES AND THERMODYNAMIC RELATIONS **(6+3)**

Pure substances - definition - phase change - p-T diagram - P-V-T surface - phase change terminologies - formation of steam - thermodynamic properties of steam - external work done during evaporation - internal latent heat - internal energy of steam - Entropy of water, evaporation, wet steam, superheated steam - Mollier diagram – Thermodynamic relations – Maxwell equations – TDS equations- heat capacities relations – energy equation – joule Thomson coefficient.

UNIT V : PSYCHROMETRY **(6+3)**

Concept of psychrometry and psychrometrices - psychrometric Relations - pressure, specific humidity, degree of saturation, relative humidity, enthalpy of moist air - Sling psychrometer - psychrometric charts - Psychrometric processes

TOTAL (L: 30 + T: 15) = 45 PERIODS

TEXT BOOKS:
1. Rajput.R.K, "A Textbook of Engineering Thermodynamics", 5th ed., Laxmi Publications, 2017
2. MichaelA.Boles,YunusA.Cengel,"Thermodynamics:AnEngineeringApproach",8th ed.,TataMcGraw-HillEducation,2017
REFERENCES:
1. Nag.P.K,"EngineeringThermodynamics",5th ed.,McGrawHillEducation,2013 2. Arora.C.P,Thermodynamics,TataMcGraw-HillEducation,2003 3. Moran,Shapiro,BoettnerandBailey"PrinciplesofEngineeringThermodynamics",8th ed.,WileyIndiaPvtLtd-2015 4. Holman.J.P,"Thermodynamics",10th ed.,McGrawHillEducation,2011 5. Rao.Y.V.C," An Introduction to Thermodynamics",RevisedEdition,OrientLongman,2009

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	2		1				1	2	2	2	
2	3	3	2	2		1				1	2	2	2	
3	3	3	2	3		1				1	2	2	2	
4	3	3	2	2		1				1	2	2	2	
5	3	2	3	1		2				1	2	2	2	
CO (W.A)	**3**	**2.6**	**2.2**	**2**		**1.2**				**1**	**2**	**2**	**2**	

22MEC05 FLUID MECHANICS AND MACHINERY					
		L	T	P	C
		3	0	2	4
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To introduce the fundamentals of fluid mechanics and its properties	**1.1**	Demonstrate the fundamental concepts of fluid mechanics with different properties of fluids.		
2.0	To impart basic knowledge to determine major and minor losses in flow through pipes and boundary layer concept.	**2.1**	Calculate major and minor losses associated with pipe flow in piping networks.		
3.0	To give the fundamental knowledge on physical quantities and to predict the behavior of the prototype/model by applying model laws.	**3.1**	Predict the nature of physical quantities and to predict the behavior of the prototype/model by applying model laws.		
4.0	To introduce the types and working principles of hydraulic turbines and evaluate the performance of hydraulic turbines	**4.1**	Evaluate the performance of hydraulic turbines.		
5.0	To understand the functioning and characteristic curves of pumps	**5.1**	Demonstrate working principle and performance of centrifugal and recirocating pumps.		

UNIT I - FLUID PROPERTIES AND FLOW CHARACTERISTICS	**(9)+(3)**
Units and dimensions – Definition of fluids - Properties of fluids - mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, surface tension and capillarity. Flow characteristics -concept of control volume - application of continuity equation, energy equation and momentum equation. **Lab Experiments:** ➢ Verification of Bernoulli's equation ➢ Determination of the coefficient of discharge of given Orifice meter/ Venturimeter.	
UNIT II - FLOW THROUGH CIRCULAR CONDUITS	**(9)+(3)**
Laminar flow through circular conduits – Hagen Poiseuille equation - Boundary layer concepts -types of boundary layer thickness -Darcy Weisbach equation –friction factor - Moody diagram - minor losses - Flow through pipes in series and parallel - Hydraulic and energy gradient lines. **Lab Experiments:** ➢ Determination of friction factor for a given set of pipes ➢ Determination of minor losses in pipes	
UNIT III - DIMENSIONAL ANALYSIS AND SIMILITUDE	**(9)**
Fundamental dimensions - Dimensional homogeneity – dimensional analysis by using Buckingham's π theorem method - Similitude – types of similitude - Dimensionless parameters - application of dimensionless Parameters-Model analysis.	
UNIT IV - TURBINES	**(9)+(5)**
Classification of turbines -heads and efficiencies -velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines - working principles - work done by water on the runner - unit quantities - Specific speed. **Lab Experiments:** ➢ Performance studies on Pelton wheel ➢ Performance studies on Francis turbine ➢ Performance studies on of Kaplan turbine	

UNIT V - PUMPS	(9)+(4)
Classification of Pumps - Centrifugal pumps-working principle - work done by the impeller - various efficiencies-velocity components at entry and exit of the rotor - velocity triangles - Reciprocating pump - working principle - work done. **Lab Experiments:** ➢ Performance studies on centrifugal pump ➢ Performance studies on reciprocating pump	
TOTAL (L:45 + P:15) = 60 PERIODS	

TEXT BOOK:

1. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, Laxmi Publications (P) Ltd., New Delhi. 2019. Reviced 9th Edition (Unit I, II, III, IV, V)

REFERENCES:

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi 2019. 22nd Editon (Unit I, II, III, IV, V)
2. Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, "Fluid Mechanics and Machinery", John Wiley & Sons; 9th Edition SI Version 2015. (UNIT - I, II, III, IV, V)
3. Kumar. K.L., Engineering Fluid Mechanics, S Chand., New Delhi, 2016. 8th Edison (Unit I, II, III)
4. Streeter. V. L., and Wylie, E.B., Fluid Mechanics, McGraw Hill, 2017. 9th Edition (Unit I, II, III)
5. Rajput. R. K, "A text book of Fluid Mechanics and Hydraulic Machines", S. Chand & Company Ltd., New Delhi, sixth edition, 2010 (Unit I, II, III, IV, V).

WEB RESOURCES

https://nptel.ac.in/courses/105101082/
https://nptel.ac.in/courses/112105183/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3							3	3		2	3	
2	3	3							3	3		2	3	
3	3	3	2						3	3		2	3	
4	3	3							3	3		2	3	
5	3	3							3	3		2	3	
CO (W.A)	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**3**	**-**

22MEC06 MANUFACTURING PROCESSES					
		L	T	P	C
		3	0	0	3
PREREQUISITE:					

Course Objectives		Course Outcomes	
1.0	To acquire knowledge on basic concepts of foundry and casting processes	**1.1**	Choose the suitable casting process to produce the simple casting components and prepare mould with core
2.0	To learn various metal joining processes and gain welding skills.	**2.1**	Categories and select appropriate metal joining process
3.0	To provide the knowledge on various bulk deformation processes and its applications.	**3.1**	Illustrate the different bulk deformation processes.
4.0	To expose knowledge on sheet metal forming processes and special forming processes and to make small sheet metal parts.	**4.1**	Explain the sheet metal forming processes and make simple sheet metal components.
5.0	To learn about the various plastics moulding and forming processes and to make simple plastic part.	**5.1**	Identify the suitable moulding and forming processes of plastics for produce simple plastic parts

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 – CO_2 casting –- Defects in Sand casting process-remedies	
UNIT II - 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 III – BULK DFORMATION 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 IV – SHEET METAL FORMING AND SPECIAL FORMING 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 (L:45) : 45 PERIODS	

TEXT BOOK:

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

REFERENCES:

1. HajraChoudhury S.K, HajraChoundhury A.K and Nirjhar Roy, "Elements of Workshop Technology", Vol. 1, 2017
2. HMT, "Production Technology", "McGraw Hill Education", 2017
3. Sharma.P.C, "A Textbook of Production Technology", S. Chand Publications, 2014
4. S. Gowri P. Hariharan, A.SureshBabu, Manufacturing Technology I, Pearson Education, 2008.
5. Ro y. A. Lindberg, Processes and materials of manufacture, PHI / Pearson education, 2006.
6. Rajput.R.K, "A Textbook of Manufacturing Technology", 2nd ed., Laxmi Publications (P) Ltd, 2016

COs	**POs**												**(PSOs)**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	-	2	-		-	-	-	1	2		2	3	-
2	3	-	2	-		-	3	-	1	2		2	3	-
3	3	-	2			-	-	-	1	2		2	3	-
4	3	-	2		-	-	-	-	1	2		2	3	-
5	3	-	2	-		-	-	-	1	2		2	3	-
CO (W.A)	**3**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**1**	**2**		**2**	**3**	**-**

22MEC07 ENGINEERING MATERIALS AND METALLURGY

L	T	P	C
3	0	0	3

PRE REQUISITE :

Course Objectives		Course Outcomes	
1.0	To develop the knowledge on structure of materials including crystallography, microstructure, defect	**1.1**	Suggest suitable engineering materials for different application
2.0	To understand the importance of various ferrous materials and phase diagram.	**2.1**	Infer the composition and properties of ferrous metals and phase diagram
3.0	To apply the suitable heat treatment process to Enhance the property of a material.	**3.1**	Apply suitable heat treatment process based on material properties
4.0	To know mechanical properties of materials.	**4.1**	Evaluate the mechanical behavior of materials for different applications
5.0	To give insight in to advanced materials such as polymers, ceramics and composite and their applications.	**5.1**	Demonstrate the structure-property relationship and allied applications of polymers and ceramics

UNIT I - STRUCTURES OF MATERIALS	**(9)**
Materials Science - Simple Crystal Structures - BCC, FCC, HCP Structures - Unit Cell - Defects - Point, Line, Surface, Volume - Slip planes and slip systems - Schmid's rule - Polymorphism and allotropy.	
UNIT II - PHASE DIAGRAMS AND PHASE TRANSFORMATION	**(9)**
Gibbs's Phase rule - Solidification and Solid Solutions - Equilibrium Diagrams - Classification of Equilibrium Diagrams - Isomorphous System - Eutectic systems, Eutectoid, Peritectic and Peritectoid system - Iron-Iron carbide phase diagram - Phase, Time - Temperature - Transformation (TTT), Continuous Cooling Transformation (CCT) and Martensitic Transformation - Types and applications of Steels and Cast Irons.	
UNIT IV - HEAT TREATMENT PROCESS	**(9)**
Heat treatment – Overview – Objectives – Annealing and types, normalizing, quenching, austempering and martempering – microstructure changes – Surface hardening processes - Carburizing – nitriding – cyaniding and carbonitriding, induction and flame hardening, Laser and Electron beam hardening.	
UNIT IV - MECHANICAL PROPERTIES OF MATERIALS	**(9)**
Testing of Materials - Classification of tests, Tensile test, Impact test, Hardness test Tension and Torsion test - Stress-strain Curve - Fractures in metals - Ductile Fracture, Brittle Fracture - Methods of protection against fracture - Creep test - stages of creep - Prevention of Creep Fracture	
UNIT V –ADVANCED MATERIALS	**(9)**
Non Ferrous Metals - Aluminium, Copper, Nickel, Magnesium, Zinc, Lead, Non Ferrous Alloys - Copper alloys, Aluminium alloys - precipitation of hardening, Magnesium alloys and Nickel alloys. Non Metallic Materials - Polymers, Ceramics and Composites - Overview of Nanomaterials.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:
1. Balasubramaniam R. "Callister's Materials Science and Engineering". 2nd Edition, Wiley India Pvt. Ltd., 2017
REFERENCES:
3. Kenneth G.Budinski and Michael K.Budinski, Engineering Materials Prentice-Hall of India 4. Raghavan.V. Materials Science and Engineering, Prentice Hall of India 5. PremamoyGhosh., "Polymer Science and Technology: Plastics, Rubbers, Blends and Composites". 3rd Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011. 6. SinaEbnesajjad. "Handbook of Biopolymers and Biodegradable Plastics: Properties, Processing and Applications", 1st Edition, Elsevier, Amsterdam, Netherlands, 2012. 7. Bolton, W., Engineering materials technology: Butterworth-Heinemann.

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	-	-	-	-	-	-	3	2	2	2	-
2	3	-	-	-	-	-	-	-	-	3	2	2	2	-
3	3	-	-	-	-	-	-	-	-	3	2	2	2	-
4	3	2	2	-	2	-	-	-	-	3	2	2	2	-
5	3	2	2	-	-	-	-	-	-	3	2	2	2	-
CO (W.A)	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**2**	**2**	**2**	**-**

22MEP02 COMPUTER AIDED MACHINE DRAWING

L	T	P	C
0	0	4	2

PRE REQUISITE :

Course Objectives		Course Outcomes	
1.0	To instruct the basics of geometric dimensioning and tolerance which is incorporate with machine components.	1.1	Remember to permit dimensional variations in the manufacture of components
2.0	To inculcate the important of tolerances and fit in the assembly of the machine components.	2.1	Apply suitable tolerances to assemble parts and features, to ensure assembly of fit and functionality
3.0	To impart the knowledge of drawing practices for common machine components	**3.1**	Illustrate various machine components through drawings.
4.0	To familiarize in drawing assembly, orthographic and sectional views of various machine components.	**4.1**	Draw the various components/products elements using modeling software.
5.0	To Formulate the detailed drawing of the given component	**5.1**	Imagine and draw the assembled views of machine parts using modeling software.

PART I DRAWING STANDARDS & FITS AND TOLERANCES 12

Code of practice for Engineering Drawing, Welding symbols, riveted joints, keys, and fasteners Limits, Fits– Tolerancing of individual dimensions - basic principles of Geometric Dimensioning &Tolerancing

PART II MODELING AND ASSEMBLY 48

List of Experiment

Creation of 3D modeling, assembly and drafting of Plummer Block

Creation of 3D modeling, assembly and drafting of Connecting Rod

Creation of 3D modeling, assembly and drafting of Universal Coupling

Creation of 3D modeling, assembly and drafting of Knuckle Joint

Creation of 3D modeling, assembly and drafting of Screw Jack

TOTAL:60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	3		3					2		3	3	3
2	3	2	3		3					2		3	3	3
3	3	2	3		3					2		3	3	3
4	3	2	3		3					2		3	3	3
5	3	2	3		3					2		3	3	3
CO (W.A)	**3**	**2**	**3**		**3**					**2**		**3**	**3**	**3**

22MAN07 – SOFT / ANALYTICAL SKILLS - III *(Common to all Branches)*					
		L	**T**	**P**	**C**
		1	**0**	**2**	**0**
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	Improving overall language proficiency for personal or professional reasons	**1.1**	The students will be able to enhance their writing skills		
2.0	To develop problem solving skills across all levels	**2.1**	The students will be able to develop problem solving skills across all levels		
3.0	To develop students to workout solutions for problems that involving general reasoning.	**3.1**	The students will be able to solve reasoning problems with ease.		

UNIT I – Verbal Competency	**(5+10)**
Sentence Selection-Paragraph Formation- Sentence Correction- Spellings.	
UNIT II - Aptitude	**(5+10)**
Clocks, Calendar, Age Problems-Problem on Trains- Problems on Numbers - Partnerships.	
UNIT III – Logical & Reasoning	**(5+10)**
Coding and Decoding - Logical Equivalent- Venn Diagram Problem.	
TOTAL (L:15, P:30) : 45 PERIODS	

REFERENCES:

1. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", Fourth Edition, Cambridge University, 2012.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	3	3	-	2	-	1
2	-	3	2	2	-	-	1	-	2	-	-	3	2	-
3	-	3	2	2	-	-	1	-	2	-	-	3	2	-
CO (W.A)	-	2	1.3	1.3	-	-	0.6	-	2.3	1	-	2.6	1.3	0.3

22MAN09 INDIAN CONSTITUTION (Common to All Branches)					
		L	T	P	C
		1	0	0	0
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To educate students to learn about the Constitutional Law of India.	**1.1**	The students will be able to Gain Knowledge about the Constitutional Law of India.		
2.0	To motivate students to Understand the role of Union Government.	**2.1**	The students will be able to know the Union Government and role of President and Prime Minister.		
3.0	To make students to understand about State Government.	**3.1**	The students will be able to acquire knowledge about State Government and role of Governor, Chief Minister.		
4.0	To understand about District Administration, Municipal Coporation and Zila Panchayat.	**4.1**	The students will be able to understand the District Administration, Municipal Coporation and Zila Panchayat.		
5.0	To encourage students to Understand about the election commission.	**5.1**	The students will be able to understand the role and function of election commission.		

UNIT I - The Constitution - Introduction	**(3)**
The History of the Making of the Indian Constitution - Preamble and the Basic Structure, and its interpretation - Fundamental Rights and Duties and their interpretation - State Policy Principles.	
UNIT II – Union Government	**(3)**
Structure of the Indian Union - President – Role and Power - Prime Minister and Council of Ministers - Lok Sabha and Rajya Sabha	
UNIT III – State Government	**(3)**
Governor – Role and Power - Chief Minister and Council of Ministers - State Secretariat	
UNIT IV – Local Administration	**(3)**
District Administration - Municipal Corporation - Zila Panchayat	
UNIT V – Election Commission	**(3)**
Role and Functioning - Chief Election Commissioner - State Election Commission	
TOTAL (L:15) : 15 PERIODS	

TEXT BOOK:

1. Rajeev Bhargava, Ethics and Politics of the Indian Constitution, Oxford University Press, New Delhi, 2008.
2. B.L. Fadia, The Constitution of India, Sahitya Bhawan; New edition (2017).
3. DD Basu, Introduction to the Constitution of India, Lexis Nexis; Twenty-Third 2018 edition.

REFERENCES:

1. Steve Blank and Bob Dorf, The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company", K & S Ranch ISBN – 978-0984999392
2. Eric Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" , Penguin UK ISBN – 978-0670921607
3. Adrian J. Slywotzky with Karl Weber, Demand: Creating What People Love Before They Know They Want It, Headline Book Publishing ISBN – 978-0755388974
4. Clayton M. Christensen, The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business, Harvard business ISBN: 978-142219602.

REFERENCES: Web link

1. https://www.fundable.com/learn/resources/guides/startup
2. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
3. https://www.finder.com/small-business-finance-tips
4. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

Mapping of COs with POs / PSOs

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

22MEC09 THERMAL ENGINEERING SYSTEM					
		L	T	P	C
		3	1	0	4
PRE REQUISITE :					
Course Objectives		**Course Outcomes**			
1.0	To enable the students to gain the basic knowledge on working of I.C Engines	1.1	Demonstrate the working principles of I.C Engines and its various components		
2.0	To learn the performance calculations of I.C Engines and the working of auxiliary equipments	2.1	Calculate the performance of I.C Engines		
3.0	To Understand the working of boilers and functions of nozzles	**3.1**	Design the steam nozzles for thermal power plants		
4.0	To Comprehending the various components in thermal power plant and functions of steam turbine	**4.1**	Compute the efficiency of the Rankine cycle and steam turbine		
5.0	To Impart knowledge in the performance of Refrigeration and air-conditioning	**5.1**	Examine the CoP of Refrigeration and describe the working of air conditioning components		

UNIT I - INTERNAL COMBUSTION ENGINES – FUNDAMENTALS AND COMBUSTIONS	**(9+3)**
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 II - INTERNAL COMBUSTION ENGINES - PERFORMANCES AND AUXILIARY SYSTEMS	**(9+3)**
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 Turbo charging – Emission Norms	
UNIT III - STEAM BOILERS AND NOZZLES	**(9+3)**
Classifications – comparison - Fire tube boiler and water tube boiler – simple vertical, Cochran boiler, Locomotive, Babcock and Wilcox boilers – High pressure boiler – Lamont boiler and Loeffler boiler – Steam nozzle – convergent and divergent nozzle - steam flow through nozzles – nozzle efficiency – Metastable expansion of steam in a nozzle	
UNIT IV - STEAM POWER CYCLES AND STEAM TURBINE	**(9+3)**
Steam Power Cycles **-** Carnot Cycle - Rankine Cycle - Modified Rankine Cycle - Regenerative Cycle - Steam Turbine - Classifications – working - Impulse and reaction turbine – Compounding – velocity diagram of impulse turbine	
UNIT V - REFRIGERATION AND AIR CONDITIONING	**(9+3)**
Fundamentals of refrigeration - COP - simple vapour compression system – Effect of super heating, Effect of sub cooling - working principle of vapour absorption system - refrigerants, classification, properties - air conditioning systems- summer, winter, year round air conditioning - central system	
TOTAL (L:45+T:15) : 60 PERIODS	

TEXT BOOK:

1. Rajput.R.K, "Thermal Engineering", 11thEdition., Laxmi Publications Ltd, 2020
2. Ganesan V, Internal Combustion Engines, 4th Edition, McGraw-Hill companies, 2017

REFERENCES:

1. Ba llaney. P.L "Thermal Engineering", 25th Edition, Khanna Publishers, 2017.
2. Manohar Prasad, "Refrigeration and Air Conditioning", 3rd ed., New Age International publications, 2021
3. Arora C P, "Refrigeration and Air Conditioning",4th Edition., Tata McGraw - Hill Education, 2021
4. Rudramoorthy.R, "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2017

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3								3		3		
2	3	3								3		3		
3	3	3	3							3		3	2	
4	3	3	3							3		3	2	
5	3	3	3							3		3	2	
CO (W.A)	**3**	**3**	**3**							**3**		**3**	**2**	

22MEC10 SUBTRACTIVE MANUFACTURING PROCESSES				
	L	T	P	C
	3	0	0	3
PRE REQUISITE :				

Course Objectives		Course Outcomes	
1.0	To study the concepts and basic mechanics of metal cutting and the factors affecting machinability	**1.1**	Apply the mechanism of metal removal process and to identify the factors involved in improving machinability.
2.0	To learn working of basic and advanced turning machines.	**2.1**	Describe the constructional and operational features of centre lathe and other special purpose lathes.
3.0	To apply the working of machine namely shaping, planing, slotting and different drilling machines	**3.1**	Understand the constructional and operational features of reciprocating machine tools.
4.0	To study the basic concepts of CNC of machine tools and constructional features of CNC.	**4.1**	Apply the constructional features and working principles of CNC machine tools.
5.0	To learn the basics of CNC programming concepts to develop the part programme for Machine centre and turning centre	**5.1**	Demonstrate the Program CNC machine tools through planning, writing codes and setting up CNC machine tools to manufacture a given component.

UNIT I - THEORY 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 MACHINE TOOLS	**(9)**
Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutters– machining time calculation - Gear cutting, gear hobbing and gear shaping – gear finishing methods Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding, internal grinding - micro finishing methods .	
UNIT IV – CNC MACHINES	**(9)**
Computer Numerical Control (CNC) machine tools, constructional details, special features – Drives, Recirculating ball screws, tool changers; CNC Control systems – Open/closed, point-to-point/continuous - Turning and machining centres – Work holding methods in Turning and machining centres, Coolant systems, Safety features.	
UNIT V – PROGRAMMING OF CNC MACHINE TOOLS	**(9)**
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, Setting up a CNC machine for machining.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOK:

1. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India, 7th Edition, 2018.
2. Richard R Kibbe, John E Neely, Roland O Meyer and Warren T White, "Machine Tool Practices", Prentice Hall of India, New Delhi, 10th Revised edition, 2014

REFERENCES:

1. HajraChoudhury S.K, HajraChoundhury A.K and Nirjhar Roy, "Elements of Workshop Technology", Vol. II, Media Promoters and Publishers Pvt Ltd., 2017
2. Jain R.K. and Gupta S.C., "Production Technology", Khanna Publishers, New Delhi, 2014
3. Rao P.N, "Manufacturing Technology - Metal Cutting and Machine Tools", Vol. I & II Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi, 2017
4. Sharma P.C., "A Textbook of Production Technology", S.Chand and Company Ltd., 2014
5. Peter Smid, CNC Programming Handbook, Industrial Press Inc.; Third edition, 2007.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	-	1	-	-	-	-	3	-	2	3	-
2	3	3	3	-	1	-	-	-	-	3	-	2	3	-
3	3	3	3	-	1	-	-	-	-	3	-	2	3	-
4	3	3	3	-	1	3	-	-	-	3	-	2	3	2
5	3	3	3	-	1	3	-	-	-	3	-	2	3	2
CO (W.A)	**3**	**3**	**3**	**-**	**1**	**3**	**-**	**-**	**-**	**3**	**-**	**2**	**3**	**2**

22MEC11 STRENGTH OF MATERIALS					
		L	T	P	C
		3	0	2	4
PRE REQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To provide knowledge about stress distribution and strain in regular and composite structures subjected to axial loads	**1.1**	Determine stress and strain in regular and composite structures subjected to axial load and thermal load.		
2.0	To familiarize about bi-axial stress systems and stresses in thin cylinders	**2.1**	Evaluate the stresses in bi-axial stress systems and thin cylinders		
3.0	To give input on shear force, bending moment diagrams and evaluate the bending stress in different beams under transverse loading	**3.1**	Assess the shear force, bending moment and bending stresses in beams under transverse loading		
4.0	To impart knowledge on finding slope and deflection of beams and buckling of columns for different boundary conditions	**4.1**	Evaluate the slope and deflection of beams and buckling loads of columns under different boundary conditions		
5.0	To provide awareness on stresses on shafts and helical springs based on theory of torsion	**5.1**	Apply torsion equation in design of circular shafts and helical springs		

UNIT I: STRESSES AND STRAIN	**9**
Introduction to material properties, Stress-strain curve for ductile and brittle materials, Hooke's law, Stresses and strain due to axial force in Stepped and Composite bars, Stresses due to thermal effect in composite bars, Factor of safety, Poisson-ratio, Volumetric strain, Elastic constants and their relationship	
UNIT II: BI-AXIAL STRESS SYSTEM	**9**
State of stresses at a point, Normal and shear stresses on inclined planes, Principal planes and Principal stresses, Plane of maximum shear stress, Mohr's circle for bi-axial stress with shear stress. Hoop and longitudinal stresses in thin cylindrical vessels, Maximum Shear stress, Changes in dimensions and volume.	
UNIT III: SHEAR FORCE, BENDING MOMENT AND STRESSES IN BEAMS	**9**
Types of beams, supports and Loads, Shear force and Bending Moment diagram of Cantilever, simply supported and overhanging beams, Point of contra flexure. Theory of Simple Bending, Bending stress.	
UNIT IV: DEFLECTION OF BEAMS AND COLUMNS	**9**
Slope and Deflection of cantilever and simply supported beams by Double integration method and Macaulay's method. Types of Columns, Equivalent length, Euler and Rankine's formulae, Slenderness ratio	
UNIT V: TORSION IN SHAFT AND HELICAL SPRING	**9**
Torsion equation - stresses and deformations in circular solid, circular hollow and stepped shafts - Closed coil helical spring-stresses and deflection under axial load.	

LIST OF EXPERIMENTS

1. Study of Stress / Strain curves for various materials
2. Tension test on steel rod
3. Double shear test in UTM
4. Rockwell Hardness test
5. Brinell Hardness Test
6. Izod impact test
7. Deflection test on Steel beam
8. Deflection test on Wooden beam
9. Compression test on Bricks
10. Compression test on helical spring

TOTAL (L:45 + P:30): 75 PERIODS

TEXT BOOK:

1. Bansal.R.K, "A textbook of Strength of Materials: (Mechanics of Solids) SI Units", 6th ed., Laxmi Publications, 2017
2. Ferdinand Beer Jr., E. Russell Johnston Jr., John T. DeWolf and David F. Mazurek, "Mechanics of Materials", 7th ed., McGraw Hill, 2011

REFERENCES:

1. S.S. Rattan, Strength of Materials, McGraw Hill Education (India) Private Limited, Chennai, Third Edition, 2017
2. S.S. Bhavikatti, Strength of Materials, Vikas Publishing House, New Delhi, Fourth edition, 2013
3. Egor P. Popov, Engineering Mechanics of Solids, Pearson India Education Services Pvt Ltd, New Delhi, 2015
4. Ramamrutham.S and Narayanan.R, "Strength of Materials", DhanpatRai Publications, 2017
5. Rajput R.K, "Strength of Materials", 6th ed., S.Chand and Company Ltd, 2015

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	1						3	3		2	2	
2	3	3	2						3	3		2	2	
3	3	3	2						3	3		2	2	
4	3	3	2						3	3		2	2	
5	3	3	2						3	3		2	2	
CO (W.A)	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**2**	**-**

22MEC12 - THEORY OF MACHINES					
		L	T	P	C
		3	0	2	4
PRE REQUISITE : 22MEC03-Engineering Mechanics					
Course Objectives		**Course Outcomes**			
		At the end of the course, the students would be able to			
1.0	To know the basic components and velocity / acceleration analysis of mechanisms.	**1.1**	Demonstrate the working of various mechanisms and determine the velocity and acceleration of mechanisms.		
2.0	To understand the basic concepts of toothed gearing and kinematics of gear trains.	**2.1**	Describe the concepts and applications of kinematics of gears and gear trains.		
3.0	To acquire knowledge on cam mechanisms for specified output motions and the effects of friction in machine elements.	**3.1**	Explain the concepts of cam follower system and examine the friction concepts in various engineering applications.		
4.0	To introduce the concepts of static and dynamic force analysis in mechanisms and reciprocating engines.	**4.1**	Analyze the static and dynamic forces in mechanisms and reciprocating engines.		
5.0	To learn the balancing concepts of rotating and reciprocating masses and the various types of vibrations	**5.1**	Apply the balancing concepts in reciprocating and rotating masses to solve problems; and Compute the frequency of various types of vibrations.		

UNIT - I KINEMATICS OF MECHANISMS AND ANALYSIS	**(9)**
Mechanisms – Terminology and definitions – Degree freedom of simple mechanism – Grashof"s Law - Kinematic Inversions of Four bar chain, Single slider and Double slider crank chains –kinematics Analysis in slider crank mechanism - Velocity and Acceleration- Analytical method.	
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 KINEMATICS OF CAMS AND FRICTION DRIVES	**(9)**
Classifications of Cams and Followers - Displacement diagrams for uniform velocity, simple harmonic motion, constant acceleration and deceleration, cycloidal motions - Graphical layout of radial cam profile with in-line knife edge follower- tangent cam and circular arc cam. Friction- Surface contacts – Sliding and Rolling friction- Friction drives – Plate clutches and belt drive.	
UNIT – IV FORCE ANALYSIS	**(9)**
Static force analysis - static equilibrium conditions - free body diagrams - static Equilibrium conditions – Two, Three and four members - graphical force analysis without friction for four bar mechanism and slider crank mechanism - Dynamic force analysis in Reciprocating Engines –D'Alembert's principle - analytical method of engine force analysis without inertia.	
UNIT – V BALANCING AND VIBRATION	**(9)**
Static and Dynamic balancing - Balancing of rotating masses – balancing of reciprocating masses - tractive force, swaying couple, hammer blow – vibration- Free longitudinal and transverse vibrations – natural Frequency – Damped Vibration – critical speed of simple shaft –torsional vibrations on single and two rotor systems.	

LIST OF EXPERIMENTS

1. Determination of transmission angle and toggle position of four bar mechanisms.
2. Determination of ratio of time of cutting stroke to return stroke and length of stroke of quick return mechanism.
3. Experimental study of Gears, Gear trains and Differential unit.
4. Determination of moment of inertia of an object by oscillation method.
5. Determination of jump speed of the cam.
6. Balancing of rotating mass of the shaft.
7. Deflection of fixed –free cantilever beam.
8. Determination of natural frequency of vibration of the spring mass system.
9. Determination of whirling speed of shaft.
10. Determination of natural frequency of the free torsional vibration of the single rotor system.

TOTAL (L:45 + P:30): 75 PERIODS

TEXT BOOK:

1. John J. Uicker, Jr., Gordon R. Pennock and Joseph E. Shigley, "Theory of Machines and Mechanisms - SI Edition", 4th ed., Oxford University Press, 2017
2. Khurmi.R.S and Gupta.J.K, "Theory of Machines", 15th ed., S.Chand & Company Pvt. Ltd., 2017

REFERENCES:

1. Rattan.S.S, "Theory of Machines", 5th ed., McGraw Hill Education India Private Limited, 2019
2. Ambekar A.G, "Mechanism and Machine Theory",1st ed., Prentice Hall of India, 2013
3. Bansal.R.K and Brar.J.S, "Theory of Machines", 5th ed., Laxmi Publications, Revised 2016
4. Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", East-West Publications, 2008
5. Kenneth J Waldron and Gary L Kinzel, "Kinematics, Dynamics, and Design of Machinery", 3rd ed., Wiley India Pvt Ltd, 2016

COs	POs												PSOs	
	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	3	-	-	-	-	2	2	-	3	2	-
3	3	3	3	3	-	-	-	-	2	2	-	3	2	-
4	3	3	3	2	-	-	-	-	2	2	-	3	2	-
5	3	3	3	2	-	-	-	-	2	2	-	3	2	-
CO (WA)	**3**	**3**	**3**	**2.4**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**3**	**2**	**-**

22MEP03 THERMAL ENGINEERING LABORATORY					
		L	T	P	C
		0	0	4	2
PRE REQUISITE :					
Course Objectives		**Course Outcomes**			
1.0	To know the method to conduct performance measurement in thermal systems	1.1	Conduct the experiments on various thermal engineering systems and analyze the performance		
2.0	To understand the properties of fuels in thermal applications	2.1	Analyze the performance of blowers, fan and internal combustion engines		
3.0	To acquire knowledge on operating Characteristics of Internal Combustion engines	**3.1**	Know how to balance the heat energy available in engine cylinder after the combustion process		
4.0	To conduct the performance test on air compressors	**4.1**	Estimate the performance of air compressors		
5.0	To conduct the performance test on boiler and steam turbine	**5.1**	Determine performance of boiler and steam turbine		

PART I IC ENGINES LABORATORY

List of Experiments

CYCLE - I

1. Valve timing and Port Timing Diagrams
2. Determination of flash point, fire point and viscosity of fuels
3. Performance test on C.I engines
4. Morse test on multi cylinder engine
5. Determination of Frictional power using retardation test
6. Heat balance test on C.I engines with Data Acquisition system

CYCLE - II

7. Performance test on air blower
8. Performance test on reciprocating air compressor
9. Measurement of lift and drag force of an aero foil model
10. Performance test on air conditioning system.
11. Performance test on Refrigeration system.
12. Study of Steam Generators and Turbines.

TOTAL:60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2						2	3		3	2	
2	3	3	2				2		2	3		3	2	
3	3	3	2				2		2	3		3	2	
4	3	3	2						2	3		3	2	
5	3	3	2						2	3		3	2	
CO (W.A)	**3**	**3**	**2**				**2**		**2**	**3**		**3**	**2**	

22MEP04 SUBTRACTIVE MANUFACTURING PROCESSES LABORATORY

	L	T	P	C
	0	0	4	2

PRE REQUISITE :

Course Objectives		Course Outcomes	
1.0	To carry out machining operations in lathe machines	**1.1**	Machine cylindrical and prismatic parts using metal removal process
2.0	To understand the methods of calculating cutting forces	**2.1**	Estimate the cutting forces in machining operations of different materials
3.0	To gain skills in performing shaping, slotting, milling, grinding machine, gear hobbing	**3.1**	Develop gear model by using gear generation and gear hobbing processes
4.0	To acquire knowledge on the cutting forces, average chip-temperature and surface finish during metal removal processes	**4.1**	Identify the process parameters for machining various materials
5.0	To understand the effect of process parameters on material removal processes	**5.1**	Select a suitable machining process by considering the product requirements

LIST OF THE EXPERIMENTS

1. Fabricating simple structural shapes using Gas and Arc Welding machine.
2. Preparing green sand moulds with cast patterns.
3. Conversion of round rod into square/hexagonal rod using forging.
4. Taper Turning, External Thread Cutting & Knurling on circular parts using lathe machine.
5. Eccentric Turning on circular parts using lathe machine.
6. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
7. Drilling and Reaming using vertical drilling machine.
8. Milling contours on plates using vertical milling machine.
9. Cutting spur and helical gear using horizontal milling machine.
10. Generating gears using gear hobbing machine.
11. Grinding components using cylindrical and 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

TOTAL (P:60) : 60 PERIODS

Mapping of COs with POs / PSOs														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2	-	-	-	2	-	3	2	-	2	3	-
2	3	3	2	-	-	-	2	-	3	2	-	2	3	-
3	3	3	2	-	-	-	2	-	3	2	-	2	3	-
4	3	3	2	-	-	-	2	-	3	2	-	2	3	-
5	3	3	2	-	-	-	2	-	3	2	-	2	3	-
CO (W.A)	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**3**	**2**	**-**	**2**	**3**	**-**

22MAN08 – SOFT / ANALYTICAL SKILLS - IV *(Common to all Branches)*					
			L	**T**	**P**	**C**
			1	**0**	**2**	**0**
PRE REQUISITE :					
Course Objectives		**Course Outcomes**			
1.0	To recollect the functional understanding of basic grammar and its structure	**1.1**	The students will be able to apply the knowledge of basic grammar to construct the sentences.		
2.0	To develop students to workout solution for problems that involves mathematics aptitude.	**2.1**	The students will be able to solve aptitude problems with ease		
3.0	To enrich their knowledge and to develop their logical reasoning ability	**3.1**	The students will be able to solve reasoning problems with ease.		

UNIT I - Verbal	**(5+10)**
Articles - Fill in the blanks - Grammatical Error - Sentence improvement	
UNIT II – Aptitude	**(5+10)**
Speed and Distance- Time and Work- Mixture And Alligations- Permutation and Combinations	
UNIT III - Logical and Reasoning	**(5+10)**
Seating Arrangement- Directions and Distance- Non verbal Reasoning	
TOTAL (L:15, P:30) : 45 PERIODS	

REFERENCES:

1. Dr. R.S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S Chand and Company Limited, New Delhi, 2014.
2. Ashish Aggarwal, "Quick Arithmetic", S Chand and Company Limited, New Delhi, 2014.
3. Raymond Murphy, "English grammar in use", Fourth Edition, Cambridge University, 2012.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	-	-	-	-	-	-	3	3	-	2	-	1
2	-	3	2	2	-	-	1	-	2	-	-	3	2	-
3	-	3	2	2	-	-	1	-	2	-	-	3	2	-
CO (W.A)	-	2	1.3	1.3	-	-	0.6	-	2.3	1	-	2.6	1.3	0.3

22MAN06 ENVIRONMENTAL SCIENCE *(Common to Agri-2nd AND Mech-4thSEM)*				
	L	**T**	**P**	**C**
	2	**0**	**0**	**0**

PRE REQUISITE : NIL

Course Objectives		**Course Outcomes**	
1.0	To recognize the basic concepts of environment, ecosystems and biodiversity.	**1.1**	The students will be able to know the importance of environment and functions ecosystems and biodiversity
2.0	To impart knowledge on the causes, effects and control measures of environmental pollution.	**2.1**	The students will be able to identify the causes, effects of environmental pollution and contribute the preventive measures to the society.
3.0	To make the students conversant with the global and Indian scenario of renewable resources, causes of their degradation and measures to preserve them.	**3.1**	The students will be able to identify and understand the renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
4.0	To familiarize the concept of sustainable development goals, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.	**4.1**	The students will be able to recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
5.0	To impart knowledge on the e-waste and its recycling methods of cell phone, battery, laptop and PCB.	**5.1**	The students will be able to demonstrate the recycling of battery, cell phone , laptop and PCB

UNIT I - ENVIRONMENT AND BIODIVERSITY	**(6)**
Environment - scope and importance - Eco-system: Structure and function of an ecosystem- types of biodiversity - genetic - species and ecosystem diversity – values of biodiversity - hot-spots of biodiversity — conservation of biodiversity: In-situ and ex-situ.	
UNIT II - ENVIRONMENTAL POLLUTION	**(6)**
Pollution – Causes - Effects and Preventive measures of Water, Air and noise pollution - Solid waste management: methods of disposal of solid waste - Environmental protection act: Air act – Water act.	
UNIT III - RENEWABLE SOURCES OF ENERGY	**(6)**
Energy management and conservation - New Energy Sources: Different types of new energy sources – Solar energy – wind energy - Applications of Hydrogen energy, Ocean energy resources, Tidal energy conversion.	
UNIT IV – SUSTAINABILITY AND MANAGEMENT	**(6)**
Development – Factors affecting development – advantages – disadvantages – GDP - Sustainability- needs – concept - concept of carbon credit – carbon footprint – Environmental management.	
UNIT V – BATTERIES AND RECYCLING OF E-WASTE	**(6)**
Battery lifecycle - Mobile battery life cycle – Laptop battery life cycle – battery maintenance – benefits of recycling battery – E-waste – sources of e-waste - recycling of computing devices - mobile phones - PCB .	
	TOTAL (L:30) : 30 PERIODS

TEXT BOOKS:

1. Dr. A.Ravikrishan, Envrionmental Science and Engineering., Sri Krishna Hitech Publishing co. Pvt.Ltd., Chennai,15th Edition, 2023.
2. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers , 2018.

REFERENCES:

1. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
2. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

WEBLINK:

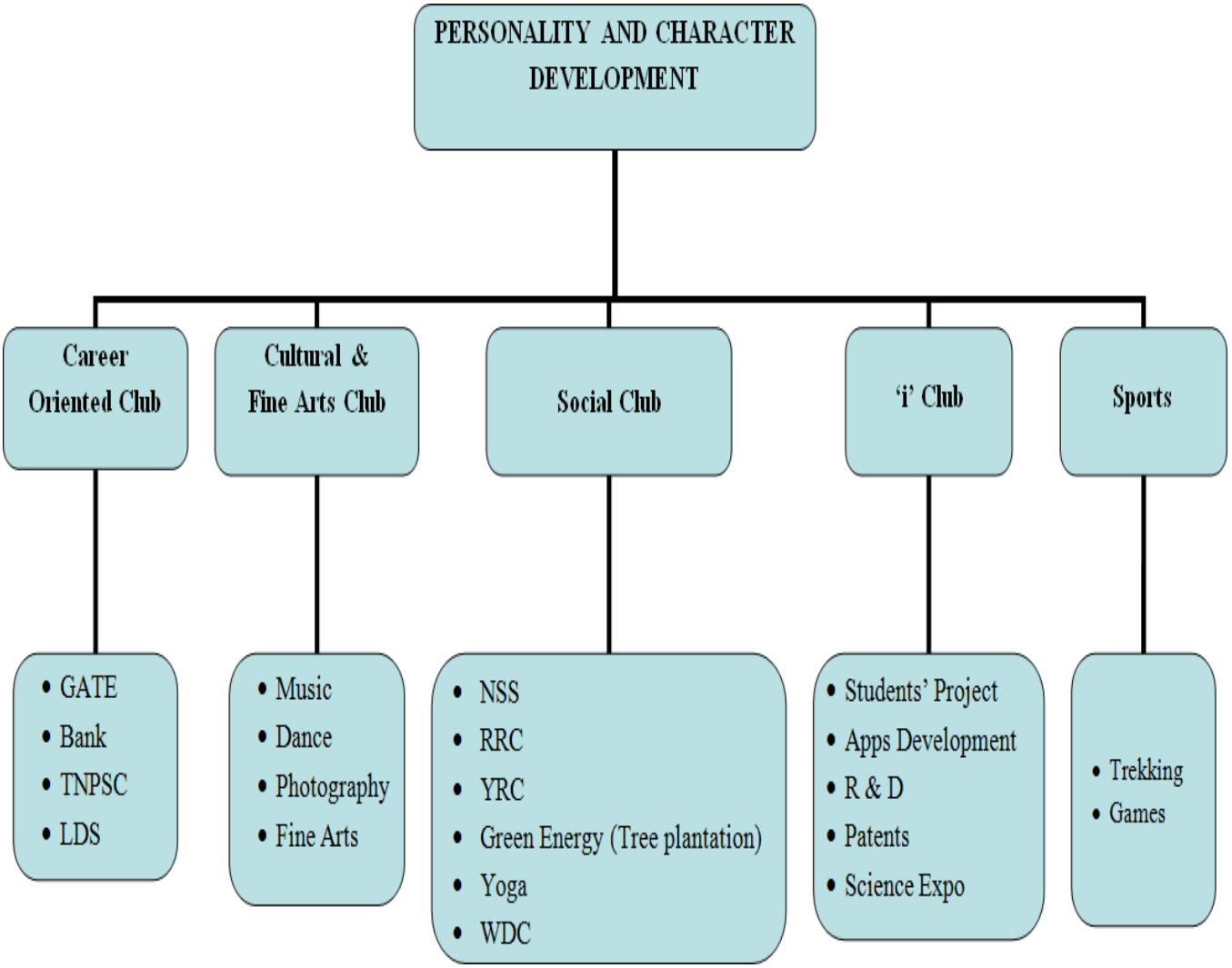
1. http://www.jnkvv.org/PDF/08042020215128Amit1.pdf
2. https://www.conserve-energy-future.com/types-of-renewable-sources-of-energy.php
3. https://ugreen.io/sustainability-engineering-addressing-environmental-social-and-economic-issues/
4. https://www.researchgate.net/publication/326090368_E-_Waste_and_Its_Management
5. https://www.ewaste1.com/how-to-reduce-e-waste/

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	2			3	3	2	1			2		
2	2	2	2			3	3	2	1			2		
3	2	2	2			3	3	2	1			2		
4	2	2	2			3	3	2	1			2		
5	2	2	2			3	3	2	1			2		
CO (W.A)	**2**	**2**	**2**			**3**	**3**	**2**	**1**			**2**		

22GED01 PERSONALITY AND CHARACTER DEVELOPMENT

L	T	P	C
0	0	2	0



*LDS - Leadership Development Skills

OBJECTIVES :				
Career Oriented Club	**Cultural & Fine Arts Club**	**Social Club**	**'i' club**	**Sports**
• To provide support for identifying specific career field of interests and career path • To provide support for preparing for competitive exams	• To bring out the hidden talent of students in music, dance and other fine arts. • To promote photography skill among the students • To develop and enhance the performance of students by participating in various events • To inculcate managerial capabilities such asevent managementandstage organization	• To create social awareness anddevelop a sense of social and civic responsibility • To inculcate socially and environmentally sound practices and be aware of the benefits • To encourage the students to workalong with the people in rural areas, thereby developing their character, social consciousness, commitment, discipline and beinghelpful towards thecommunity.	• To inculcate the basic concepts of innovation • To foster the networking between students, build teams, exchange ideas, do projects and discuss entrepreneurial opportunities • To enrich the academic experience, build competencies and relationships beyond the classroom	• To provide opportunities to excel at sports • To promote an understanding of physical and mental well-beingthrough an appreciation ofstress, rest and relaxation. • To develop an ability to observe, analyze and judge the performance of self and peers in sporting activities. • To develop leadership skills and nurture the team building qualities. **Trekking:** • To provide opportunities to explore nature and educating about the purity of nature • To improve physical and mental health.

OUTCOMES : At the end of this course, the students will be able to				
• Find a better career of their interest. • Make use of their knowledge during competitive exams and interviews.	• Take part in various events • Develop team spirit, leadership and managerial qualities	• Develop socially responsive qualities by applying acquired knowledge • Build character, social consciousness, commitment and discipline	• Apply the acquired knowledge in creating better solutions that meet new requirements and market needs • Develop skills on transforming new knowledge or new technology into viable products and services on commercial markets as a team	• Demonstrate positive leadership skills that contribute to the organizational effectiveness • Take part an active role in their personal wellness (emotional, physical, and spiritual) that supports a healthy lifestyle • Create inclination towards outdoor activity like nature study and Adventure.

TOTAL [2 x (P: 15)]: 30 PERIODS

(Cumulatively for Two Semesters)

22MEX01 COMPOSITE MATERIALS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To introduce the fundamentals and manufacturing aspects of composite materials	**1.1**	List the types reinforcing materials and their composites		
2.0	To acquire knowledge on Lamina Constitutive Equations and analysis of laminated flat plates	**2.1**	Recommend a manufacturing process for a composite material		
3.0	To introduce the thermal analysis of various laminates	**3.1**	Demonstrate the governing equations of composite laminates		
4.0	To understand various failure criterions related to laminated plates	**4.1**	Make use of strength analysis techniques to predict the failure of laminated plates		
5.0	To gain knowledge about thermal analysis of composites	**5.1**	Estimate the Coefficient of Thermal Expansion of composites by selecting a thermal analysis		

UNIT I : INTRODUCTION TO COMPOSITE MATERIALS	**(9)**
Definition - matrix materials - polymers - metals - ceramics - reinforcements - particles, whiskers, inorganic fibers, metalfilaments - ceramic fibers - fiber fabrication - natural composite wood, jute - advantages and drawbacks of composites over monolithic materials - mechanical properties and applications of composites, particulate reinforced composite materials, dispersion strengthened composite, fiber reinforced composites - rule of mixtures - characteristics of fiber reinforced composites, manufacturing fiber and composite	
UNIT II : MANUFACTURING OF COMPOSITES	**(9)**
Manufacturing of Polymer Matrix Composites (PMCs) - handlay up, spray technique, filament winding, pultrusion, Resin Transfer Moulding (RTM) - bag moulding, injection moulding, Sandwich Mould Composites (SMC) - manufacturing of Metal Matrix Composites (MMCs) - solid state, liquid state, vapour state processing, manufacturing of Ceramic Matrix Composites (CMCs) - hot pressing - reaction bonding process - infiltration technique, direct oxidation - interfaces	
UNIT III : INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS	**(9)**
Lamina Constitutive Equations: Lamina Assumptions - macroscopic viewpoint - generalized Hooke's Law - reduction to Homogeneous Orthotropic Lamina - Isotropic limit case, Orthotropic Stiffness matrix (Qij), definition of stress and moment resultants - strain displacement relations - basic assumptions of laminated anisotropic plates - laminate constitutive equations - coupling - Interactions, balanced laminates, symmetric laminates, angle ply laminates, cross ply laminates - laminate structural moduli - evaluation of lamina properties from laminate tests - quasi Isotropic laminates - determination of lamina stresses within Laminates	
UNIT IV : LAMINA STRENGTH ANALYSIS AND ANALYSIS OF LAMINATED FLAT PLATES	**(9)**
Introduction - maximum stress and strain criteria - Von-Misses yield criterion for isotropic materials - generalized Hill'scriterion for anisotropic materials - Tsai-Hill's failure criterion for composites - tensor polynomial (Tsai-Wu) - failure criterion - prediction of laminate failure equilibrium equations of motion - energy formulations - static bending analysis -buckling analysis - free vibrations - natural frequencies	

UNIT V : THERMAL ANALYSIS	(9)
Assumption of constant Coefficient of Thermal Expansion (C.T.E.) - modification of Hooke's law - modification of laminate constitutive equations - orthotropic lamina C.T.E's - C.T.E's for special laminate configurations - unidirectional, off-axis,symmetric balanced laminates, zero C.T.E laminates, thermally quasi-isotropic laminates	
TOTAL (L:45) = 45 PERIODS	

TEXTBOOKS:

1. Malik, P.K., "Fiber Reinforced Composite: Materials, Manufacturing and Design", 3rd ed., CRC Press, 2007
2. Ronald F. Gibson, "Principles of Composite Material Mechanics ", 2nd ed., CRC Press, 2007

REFERENCES:

1. Michael Hyer and Scott R White, " Stress Analysis of Fibre Reinforced Composite Materials", International edition, McGraw-Hill Education, 1998
2. Issac M. Daniel and Oril Shai, "Engineering Mechanics of Composite Materials", 2nd ed., Oxford UniversityPress, 2005
3. Bhagwan D. Agarwal, Lawrence J. Broutman and K. Chandrashekhara, "Analysis and Performance of Fiber Composites", 3rd ed., Wiley Publications, 2012
4. Mallick.P.K and Newman.S, "Composite Materials Technology: Processes and Properties", Hanser Gardner Publications, 1991
5. Deborah D. L. Chung, " Composite Materials: Science and Applications", 2nd ed., Springer, 2012

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2		2	1	1						2	2	1	
2	2		2	1	1						2	2	1	
3	2		2	1	1						2	2	1	
4	2		2	1	1						2	2	1	
5	2		2	1	1						2	2	1	
CO (W.A)	2		2	1	1						2	2	1	

22MEX02 TOOL DESIGN					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To teach students the fundamentals of work holding devices.	**1.1**	Determine the dimensions of single and multipoint cutting tools based on cutting forces		
2.0	To enable the students design tools, dies, jigs and fixtures.	**2.1**	Identify the importance of work holding device		
3.0	To teach students to analyze and optimize an existing jigs	**3.1**	Design jigs and fixtures for the given work pieces		
4.0	To gain knowledge about the design of various fixtures	**4.1**	Calculate the required specifications of a press for required operations		
5.0	To expose students to design of dies for press work and forging	**5.1**	Design tools and dies for required operations		

UNIT I : DESIGN OF CUTTING TOOLS	**(9)**
Metal cutting process - selection of tool materials - design of single point and multipoint cutting tool - form tools, drills, milling cutters, broaches and chip breakers - problems on design of single point cutting tools only	
UNIT II : LOCATING AND CLAMPING METHODS	**(9)**
Basic principles of location - locating methods and devices - principles of clamping - mechanical, pneumatic and hydraulic actuation - clamping force analysis - design problems.	
UNIT III : DESIGN OF JIGS	**(9)**
Types of drill jigs - general considerations in the design of drill jigs - drill bushings - types, methods of construction- simple designs of plate, channel, boxes, post, angle plate, turnovers and pot jigs.	
UNIT IV : DESIGN OF FIXTURES	**(9)**
Design principles - types of fixtures - fixtures for machine tools: lathe, milling, boring, broaching and grinding - assembly fixtures - inspection and welding fixtures.	
UNIT V : DESIGN OF DIES	**(9)**
Press tools - Fundamentals of die-cutting operations - Cutting action in punch and die operations - Die clearance - Blanking and Piercing Die construction - Pilots - Strippers and Pressure Pads - Press work materials - Strip layout - Design of simple progressive and compound die sets - Forging Die - Flow lines, parting lines, open and close die forging; Materials for die block.	
TOTAL (L:45) = 45 PERIODS	

TEXTBOOKS:

1. Donaldson, Lecain and Goold, "Tool Design", 3rd ed., Tata McGraw Hill, 2012
2. John G. Nee, "Tool Design", 6th ed., Society of Manufacturing Engineers, 2010

REFERENCES:

1. Venkataraman. K, "Design of Jigs Fixtures and Press Tools", Tata McGraw Hill, New Delhi, 2005
2. Joshi. P.H, "Jigs and Fixtures", 2nd ed., Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2004
3. Elanchezhian. C, "Design of Jigs Fixtures and Press Tools", Eswar Press,Chennai, 2004
4. Hoffman, "Jigs and Fixture Design", Thomson Delmar Learning, Singapore, 2004
5. Vukota Boljanovic Paquin .J. R, "Die Design Fundamentals", 3rd ed., Industrial Press, 2005

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2		2	1	1						2	2	2	
2	2		2	1	1						2	2	2	
3	2		2	1	1						2	2	2	
4	2		2	1	1						2	2	2	
5	2		2	1	1						2	2	2	
CO (W.A)	2		2	1	1						2	2	2	

22ITZ01 PYTHON PROGRAMMING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL					
Course Objectives		**Course Outcomes**			
1.0	To acquaint with data types, input output statements, decision making, looping in Python	**1.1**	The students will be able to develop understanding of basics of Python Programming constructs.		
2.0	To acquire knowledge about manipulation of strings.	**2.1**	The students will be able to impart basic knowledge of all strings functions.		
3.0	To be familiarized with programming concepts like list and tuples.	**3.1**	The students will be able to choose most appropriate programming constructs and features to solve the problems with list, tuples and dictionaries.		
4.0	To understand the concepts of dictionaries, function and modules.	**4.1**	The students will be able to exhibit the programming skills for the use of the logical constructs of language using function and files.		
5.0	To develop the skill of designing Graphical user Interfaces in Python	**5.1**	The students will be able to demonstrate significant experience with the Python program development environment.		

UNIT I - INTRODUCTION TO PYTHON	**(9)**
Introduction to python: Features - Execution of python program – Flavors of Python – Comments - Data Types: Built-in data types– Sequences – Set - Literals– Operators – Input and Output Statements - Control Statements if – if-else –if-else-if – while-For –Nested loops – the else suite - Break – Continue - pass - assert – return.	
UNIT II - STRINGS	**(9)**
Arrays: One Dimensional arrays - Multi Dimensional arrays - Strings and Characters: Creating - Length - Indexing - Slicing - Repeating - Concatenation - Comparing - Removing Spaces - Finding Sub Strings - Counting Substrings in a String - Strings are Immutable - Replacing - Splitting and Joining Strings - Changing Case - Checking Starting and Ending of a String – String Formatting - Working with Characters – Sorting - Searching Strings - Finding Number- Inserting sub string into a string.	
UNIT III - LISTS , TUPLES AND DICTIONARIES	**(9)**
Lists: Creating Lists – Updating - Concatenation - Repetition - Methods – Sorting. Tuples: Creating - Accessing – Operations – Functions - Nested Tuples - Inserting Elements, Modifying Elements, Deleting Elements from a tuples. Dictionaries: Operations – Methods - Using for Loop with Dictionaries – Sorting the Elements of a Dictionary using Lambdas - Converting Lists and Strings into Dictionary - Passing Dictionaries to Functions - Ordered Dictionaries.	
UNIT IV - FUNCTIONS AND FILES	**(9)**
Functions: Defining – Calling – Returning - Pass by Object Reference – Formal, Actual, Positional, Keyword, Default & Variable Length Arguments - Local and Global Variables - Recursive Functions - Lambdas - Function Decorators. Files - Types of Files - Opening & Closing a File - Working with Text Files Containing Strings -	

Working with Binary Files - The with Statement - The seek() and tell() Methods - Random Accessing of Binary Files - Random Accessing of Binary Files using mmap - Zipping and Unzipping Files - Working with Directories.	
UNIT V - MODULES AND FRAMEWORKS	**(9)**
Modules: Importing module –Features – Built in functions. - Python Environment and Frameworks: NumPy: NumPy Arrays – Computation on NumPy Arrays – Aggregation – Sorting Arrays – Structured Arrays.	
TOTAL (L:45) : 45 PERIODS	

TEXT BOOKS:

1. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 2021 Edition.
2. Jake Vander Plas, "Python Data Science Handbook Essential Tools for Working with Data", 1st Edition O'Reilly Publishers, 2016.

REFERENCES:

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2018.
2. Wesley J. Chun, "Core Python Programming", Pearson Education, 2013.

Mapping of COs with POs / PSOs

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	3	3	3	3	-	-	-	-	3	3	3
2	3	2	3	3	3	3	3	-	-	-	-	3	3	3
3	3	2	3	3	3	3	3	3	-	-	3	3	3	3
4	3	2	3	3	3	3	3	3	-	-	3	3	3	3
5	3	2	3	3	3	3	3	3	-	-	3	3	3	3
CO (W.A)	3	2	2.8	3	3	3	3	3	-	-	3	3	3	3