

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai) Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956 NAAC Accredited with 'A' Grade



TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

CURRICULUM & SYLLABI

B.E. MECHANICAL ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

REGULATIONS – 2023

(Revised)

(I – V SEMESTERS)

(For the Students Admitted in the Academic Year 2023-2024 onwards)



Note: The regulations hereunder are subject to amendments as may be decided by the Academic Council of the Sengunthar Engineering College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the program under the same Regulation as may be decided by the Academic Council.

BENGUNTHAN na 124 BOS - Chairman DEAN SENGUNTHAR ENGINEERING COL (NUTON:OMOUS)



Relation

PRINCIPAL SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS) TIRUCHENGODE - 437 205)





	INDEX	
	UNDER GRADUATE B.E MECHANICAL PROGRAMME	Pg. No
Ι	SCHEME FOR CURRICULUM	
	Curriculum 1- 8 Semester	 9 - 16
	List of Humanities and Social Sciences (HS) Courses	 17
	List of Basic Sciences (BS) Courses	 17
	List of Engineering Sciences (ES) Courses	 18
	List of Professional Core (PC)	 18
	List of Professional Elective (PE)	 19 - 21
	List of Open Elective (OE)	 22 - 24
	List of General Elective (GE)	 25
	List of Elective Management (EM)	 25
	List of Employability Enhancement Courses (EEC)	 26
	List of Mandatory Courses (MDC)	 26 - 27
	Credit Summary	 28
II	SCHEME FOR SYLLABI	
	I Semester Syllabi	 29 - 45
	II Semester Syllabi	 46 - 65
	III Semester Syllabi	 66 - 81
	IV Semester Syllabi	 82 - 94
	V Semester Syllabi	 95 - 136
III	MINOR DEGREE/HONOURS	
	a. INDUSTRIAL SAFETY ENGINEERING	 137 - 148
	b. 3D PRINTING	 149 - 160
	Credit Summary	 161







REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

B. E. MECHANICAL ENGINEERING

VISION

To be recognized as a provider of high quality education in the field of Mechanical Engineering that enables graduates to meet the needs of society and to craft intellectually - adept research centers with world class competency and cutting edge proficiency.

MISSION

- To educate, prepare and mentor students to excel as professionals.
- To provide the facilities and environment conducive to high quality education to get diverse careers as well as research in the field of Mechanical Engineering.
- To engage the students in academic as well as scholarly activities, which strengthen the department reputation in global market

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

- To provide sound foundation in engineering fundamentals necessary to analyze, formulate and solve problems.
- To develop in-depth technical knowledge and practical skills in the application of broad elements leading to successful engineering design, raising engineering standards, overcoming realistic constraints and a systematic engineering process incorporating industry needs.
- To provide relevant engineering experience in designing and conducting experiments as well as analyzing the significance of the experimental data.
- To inculcate the habit of lifelong learning for career development through successful completion of advanced degrees, professional development courses, industrial training etc.
- To impart technical knowledge, ethical values for professional development of the student to solve complex problems and to work in multi disciplinary ambience, whose solutions lead to significant societal benefits.





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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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





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PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOME (PSOs)

	Ability to understand the fundamental concepts, analyze, design, develop, implement
DSO1	using mathematical foundations and domain knowledge for providing solutions to new
F301	ideas and innovations in mechanical systems and processes towards product
	development.
	Ability to work and communicate effectively in a team environment and foster the
F302	professional skills towards industrial and societal needs.
	Ability to grasp the advancements in mechanical systems, processes, software and
PSO3	creating a career path to become an entrepreneur, lifelong learner with moral values and
	ethics.





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MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

No	0	O anna Nama						F	o							PSO	
Year	Sem	Course Name	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		23HST101 - Professional English	-	-	-	-	-	1.4	2.2	1.25	1.8	3	-	3	-	-	-
		23MAT101 - Matrices and Calculus	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
		23HST102 – தமிழர்மரபு / Heritage ofTamils	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	I	23PHE101 - Engineering Physics	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
		23CYE101 - Chemistry for Engineers	1.6	1.6	2.4	1.25	1.8	1	2	-	-	-	-	1.5	-	-	-
		23GEE101 - Programming in C	2.	2.33	2.33	1.16	2	1.66	1	0.83	2	0.16	2.83	2.33	1.83	2.16	-
		23EEC101 - Soft Skills & Life Skills	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I		23MDC101 - Induction Program (2 Weeks)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MAT201 - Statistics and Numerical Methods	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
		23PHT201 – Advanced Physics of Materials	2	3	2	1	1.8	1	1	-	-	-	-	-	-	-	-
	II	23CYT201 - Environmental Sciences and Sustainability	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-
		23MET201 - Manufacturing Processes	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
		23HST202 - தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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	MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME PO PSO PSO PSO PSO PSO PSO PSO PSO PSO																
Year	Sem	Course Name	1	2	3	4	5	Р 6	7	8	9	10	11	12	1	2	3
		23GET201- Engineering Graphics	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
		23HSE201 - English for Engineers:Theory and Practice	-	-	-	-	2	1.2	1.2	1	2	3	-	3	-	-	-
I	II	23GEL201 - Engineering Practice Laboratory	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
		23EEC201 - Indian Language (Except Mother Tongue)/Foreign Language	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC201 - Aptitude Skills	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MAT304 - Transforms and Partial Differnetial Equations	3	3	1	-	2	-	-	1	2	-	-	2	-	-	-
		23MET301 - Engineering Thermodynamics	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1
		23MET302 - Engineering Mechanics	3	2	2	1	2	-	-	-	-	-	-	2	3	1	2
II	111	23MEE301 - Manufacturing Technology	3	2	1	-	-	1	-	-	-	-	-	1	1	1	2
		23MEE302 - Metrology and Measurement	3	2	2	2	-	-	-	-	1	-	-	1	3	2	`1
		23CEE402 - Fluid Mechanics and Machinery	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3
		23EEC301 - Professional Development	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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		MAPPING OF	COU	IRSE	EOU	TCO	ME A	ND	PRO	GR	AM (DUT	CON	1E			
	_							PC)							PS0	
Year	Sem	Course Name	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		23MET401 - Kinematics of Machinery	3	2	2	-	2	-	-	-	-	-	-	1	3	1	2
		23MET402 - Engineering Materials and Metallurgy	2	2	-	2	-	2	2	-	-	2	-	-	2	3	1
		23MEE401 - Thermal Engineering	3	3	2	2	1	1	1	-	1	-	1	3	3	1	2
	IV	23MEE402 - Strength of Materials	3	3	3	-	-	3	-	-	2	3	-	3	3	2	3
		23GEE301 - Problem solving and Python Programming	2.33	2.5	1.5	1.83	1.83	-	-	-	-	-	1.5	0.66	2.66	0.5	-
		23EEC401 – Online Certification Courses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MET501 - Design of Machine Elements	3	3	2	3	-	-	3	-	-	-	-	-	3	1	3
		23MEE501 - Dynamics of Machinery	3	3	3	3	2	-	-		-	-	-	-	3	3	2
		23MEE02 - Heat and Mass Transfer	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1
		Professional Elect	ive -	I													
	V	23MEP501 - Welding Technology	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
		23MEP502 Non - Destructive Testing and Evaluation of Materials	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
		23MEP503 - Composite Materials	3	3	1	-	-	1	2	-	-	-	1	1	-	2	1





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		MAPPING OF	COL	IRSE	EOU	TCO	ME A	ND	PRC)GR/	AM (DUT	CON	IE			
Voor	Som	Course Name						PC)							PS0	
rear	Sem	Course Name	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
		23MEP504 - Green Manufacturing	1	1	3	1	-	-	3	-	1	-	-	1	1	2	2
		23MEP505 - Unconventional Machining Processes	2	1	2	1	3	1	2	-	-	-	-	-	1	2	1
		23MEP506 - Metal Casting Process	2	2	1	2	1	-	-	-	-	-	1	3	2	2	1
		Professional Elect	ive ·	· II													
		23MEP507 - Hybrid and Vehicle Technology	3	2	2	3	2	2	-	-	-	3	-	2	1	1	1
		23MEP508 - Automobile Engineering	3	3	3	2	-	3	2	-	2	-	-	2	3	1	1
Ш	V	23MEP509 - Design of Heat Exchangers	3	2	1	2	-	-	-	-	1	1	-	1	3	2	1
		23MEP510 - Computational Fluid Dynamics	3	3	3	1	1	1	-	-	-	1	-	1	3	2	1
		23MEP511 - Refrigeration and Air Conditioning	3	2	1	-	-	1	1	3	2	2	-	2	3	2	1
		23MEP512 - Solar Thermal Systems	3	1	1	-	-	3	-	3	2	3	-	1	3	2	1
		Professional Elect	ive ·	• III	_	-			-		-					_	
		23MEP513 - Product Design and Development	2	1	3	2	1	-	-	-	-	-	-	1	3	2	1
		23MEP514 - Computer Applications in Design	1	2	1	3	3	2	-	-	-	-	-	2	1	1	2
		23MEP515 - Fluid Power Systems	2	1	1	1	2	-	-	-	-	-	-	1	2	2	1



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MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Voar	Som	Course Name	ро												PS0			
Tear	Jein	Course Name	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
		23MEP516 - Process Planning and Cost Estimation	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1	
111		23MEP517 - Power Plant Engineering	3	1	1	1	-	1	3	-	-	1	-	1	2	2	1	
	V	23MEP518 - Rapid Prototyping	3	2	3	1	2	-	-	-	-	-	-	2	2	2	1	
		23EEC501 – Industrial Training	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		23MDC501 - Mandatory Course - I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	





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SCHEME FOR CURRICULUM

B.E. – MECH (MECHANICAL)





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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - FIRST SEMESTER

Course Code	Name of the Subject	Category	Pe	erioc Nee	ls / k	Credit	Maxi	imum N	larks
			L	Τ	Ρ	С	CIA	ESE	TOT
THEORY									
23HST101	Professional English	HS	3	0	0	3	40	60	100
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23HST102	தமிழர்மரபு/Heritage of Tamils	HS	1	0	0	1	40	60	100
EMBEDDED	COURSE								
23PHE101	Engineering Physics	BS	3	0	2	4	50	50	100
23CYE102	Chemistry for Engineers	BS	3	0	2	4	50	50	100
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
EMPLOYAB	ILITY ENHANCEMENT COURSE								
23EEC101	Soft Skills & Life Skills	EEC	1	0	0	1	100	-	100
MANDATOR	Y COURSE								
23MDC101	Induction Program (2 Weeks)	MC	-	-	-	-	-	-	-
	TOTAL CREDITS IN SEM	MESTER - I				21			
HS :	Humanities and Social Sciences								
BS :	Basic Sciences								
PC :	Professional Core								
PE :	Professional Elective								
GE :	General Elective								
OE :	Open Elective								
EEC :	Employability Enhancement Courses								
MC :	Mandatory Courses								
	Lecture								
г. Р.	Practical								
C	Credit Point								
CIA :	Continuous Internal Assessment								
ESE :	End Semester Examination								
TOT :	Total								





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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - SECOND SEMESTER

Course Code	Name of the Subject	Category	Pe	erioc Nee	ls / k	Credit	Мах	imum N	larks
			L	Τ	Ρ	С	CIA	ESE	ΤΟΤ
THEORY									
23MAT201	Statistics and Numerical Methods	BS	3	1	0	4	40	60	100
23PHT201	Advanced Physics of Materials	BS	3	0	0	3	40	60	100
23CYT201	Environmental Science and Sustainability	HS	3	0	0	3	40	60	100
23MET201	Manufacturing Processess	PC	3	0	0	3	40	60	100
23HST202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	0	0	1	40	60	100
23GET201	Engineering Graphics	ES	3	1	0	4	40	60	100
EMBEDDED	COURSE		I	1	1		l		
23HSE201	English for Engineers: Theory and Practice	HS	3	0	2	4	50	50	100
PRACTICAL	S								
23GEL201	Engineering Practice Laboratory	ES	0	0	4	2	60	40	100
EMPLOYAB	ILITY ENHANCEMENT COURSE								
23EEC201	Indian Language (Except Mother Tongue) / Foreign Language	EEC	0	0	4	2	100	-	100
MANDATOR	Y COURSE	1		1	1	-	I	n	1
23MDC201	Aptitude Skills	MC	3	0	0	0	-	-	-
	TOTAL CREDITS IN SEM	IESTER - II				26			
HS : BS : PC : PE : GE : GE : OE : EEC : MC : L : T : P : C : CIA :	Humanities and Social Sciences Basic Sciences Engineering Sciences Professional Core Professional Elective General Elective Open Elective Employability Enhancement Courses Mandatory Courses Lecture Tutorial Practical Credit Point Continuous Internal Assessment								

TOT : Total





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(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - THIRD SEMESTER

Course Code	Name of the Subject	Category	Pe	eriod Nee	ls / k	Credit	Maxi	imum N	larks
			L	Τ	Ρ	С	CIA	ESE	TOT
THEORY									
23MAT304	Transforms and Partial Differential Equations	BS	3	1	0	4	40	60	100
23MET301	Engineering Thermodynamics	PC	3	1	0	4	40	60	100
23MET302	Engineering Mechanics	PC	3	1	0	4	40	60	100
EMBEDDED	COURSE								
23MEE301	Manufacturing Technology	PC	3	0	2	4	50	50	100
23MEE302	Metrology and Measurement	PC	3	0	2	4	50	50	100
23CEE402	Fluid Mechanics and Machinery	ES	3	0	2	4	50	50	100
EMPLOYAB	ILITY ENHANCEMENT COURSE								
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
	TOTAL CREDITS IN SEM	ESTER - III				25			

- HS : Humanities and Social Sciences
- BS : Basic Sciences
- ES : Engineering Sciences
- PC : Professional Core PE : Professional Elective
- GE : General Elective
- OE : Open Elective
- EEC : Employability Enhancement Courses
- MC : Mandatory Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
- CIA : Continuous Internal Assessment
- ESE : End Semester Examination TOT : Total
- SEC UG R2023 / JUNE 2024 (REVISED)





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FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - FOURTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maxi	larks	
			L	Τ	Ρ	С	CIA	ESE	TOT
THEORY									
23MET401	Kinematics of Machinery	PC	3	1	0	4	40	60	100
23MET402	Engineering Materials and Metallurgy	PC	3	0	0	3	40	60	100
EMBEDDED	COURSE					-			
23MEE401	Thermal Engineering	PC	3	0	2	4	50	50	100
23MEE402	Strength of Materials	PC	3	0	2	4	50	50	100
23GEE301	Problem solving and Python Programming	ES	3	0	2	4	50	50	100
EMPLOYABI	LITY ENHANCEMENT COURSE								
23EEC401	Online Certification Courses	EEC	3	0	0	3	100	-	100
	TOTAL CREDITS IN SEM	ESTER - IV				22			

- HS : Humanities and Social Sciences
- BS : Basic Sciences
- ES : Engineering Sciences
- PC : Professional Core
- PE : Professional Elective GE : General Elective
- GE : General Electiv OE : Open Elective
- EEC : Employability Enhancement Courses
- MC : Mandatory Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
- CIA : Continuous Internal Assessment
- ESE : End Semester Examination
- TOT : Total





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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - FIFTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		riods / Veek		riods / Veek		Periods / Week		riods / Veek		Periods / Week		Maxi	mum N	larks								
			L	Τ	Ρ	С	CIA	ESE	TOT																										
THEORY																																			
23MET501	Design of Machine Elements	PC	3	1	0	4	40	60	100																										
	Professional Elective - I	PE	3	0	0	3	40	60	100																										
	Professional Elective - II	PE	3	0	0	3	40	60	100																										
	Professional Elective - III	PE	3	0	0	3	40	60	100																										
EMBEDDED C	COURSE																																		
23MEE501	Dynamics of Machinery	PC	3	0	2	4	50	50	100																										
23MEE502	Heat and Mass Transfer	PC	3	0	2	4	50	50	100																										
EMPLOYABI	LITY ENHANCEMENT COURSE					_																													
23EEC501	Industrial Training	EEC	0	0	4	2	100	-	100																										
MANDATORY	Y COURSE					_																													
23MDC501	Mandatory Course - I	MC	3	0	0	0	-	-	-																										
	TOTAL CREDITS IN SEM	ESTER - V				23																													
	TOTAL CREDITS IN SEM	LOILN - V				20																													

- HS : Humanities and Social Sciences
- BS : Basic Sciences
- ES : Engineering Sciences
- PC : Professional Core
- PE : Professional Elective
- GE : General Elective OE : Open Elective
- EEC : Employability Enhancement Courses
- MC : Mandatory Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
- CIA : Continuous Internal Assessment
- ESE : End Semester Examination TOT : Total
- SEC UG R2023 / JUNE 2024 (REVISED)





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - SIXTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		Periods / Week		riods / /eek		eriods / Week		Max	imum N	larks
			L	Т	Ρ	С	CIA	ESE	TOT																												
THEORY																																					
	Professional Elective IV	PE	3	0	0	3	40	60	100																												
	Professional Elective V	PE	3	0	0	3	40	60	100																												
	Professional Elective VI	PE	3	0	0	3	40	60	100																												
	Open Elective-I/NCC L1/ L3	OE	3	0	0	3	40	60	100																												
EMBEDDED	COURSE																																				
23MEE601	Finite Element Analysis	PC	3	0	2	4	50	50	100																												
23MEE602	Mechatronics	PC	3	0	2	4	50	50	100																												
EMPLOYABI	LITY ENHANCEMENT COURSE																																				
23EEJ601	Project Work - Phase I	EEC	0	0	8	4	60	40	100																												
MANDATOR	Y COURSE																																				
23MDC601	Mandatory Course - II	MC	3	0	0	0	-	-	-																												
	TOTAL CREDITS IN SEMI	ESTER - VI				24																															

- HS : Humanities and Social Sciences
- BS : Basic Sciences
- ES : Engineering Sciences
- PC : Professional Core
- PE : Professional Elective
- GE : General Elective OE : Open Elective
- EEC : Employability Enhancement Courses
- MC : Mandatory Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
- CIA : Continuous Internal Assessment
- ESE : End Semester Examination TOT : Total
- SEC UG R2023 / JUNE 2024 (REVISED)





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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - SEVENTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Maximum Mar		larks	
			L	Т	Ρ	С	CIA	ESE	тот
THEORY									
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100
	Elective - Management	GE	3	0	0	3	40	60	100
	Open Elective – II/ NCC-II L2/ L4	OE	3	0	0	3	40	60	100
	Open Elective - III	OE	3	0	0	3	40	60	100
EMPLOYABI	LITY ENHANCEMENT COURSE								
23EEJ701	Project Work - Phase II	EEC	0	0	8	4	60	40	100
	TOTAL CREDITS IN SEME	STER - VII				16			

- HS Humanities and Social Sciences 1
- BS **Basic Sciences** 2
- ES **Engineering Sciences** 2
- **Professional Core** PC 2
- PE 1 **Professional Elective**
- GE ÷ **General Elective**
- **Open Elective** OE
- EEC **Employability Enhancement Courses**
- MC Mandatory Courses
- Lecture L Tutorial
- Т Ρ
- Practical С Credit Point
- CIA **Continuous Internal Assessment**
- ESE 2 End Semester Examination
- TOT 2 Total





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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.E - MECHANICAL ENGINEERING - EIGHTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks			
			L	Τ	Ρ	С	CIA	ESE	TOT	
EMPLOYABI	LITY ENHANCEMENT COURSE									
23EEJ801	Product Development	EEC	0	0	12	6	60	40	100	
23EEC801	Internship	EEC	0	0	4	2	100	-	100	
	TOTAL CREDITS IN SEME	STER - VIII				8				

- Humanities and Social Sciences HS 1
- BS **Basic Sciences** 2
- ES **Engineering Sciences** 2
- **Professional Core** PC 1
- ΡE : **Professional Elective General Elective**
- GE OE **Open Elective**
- EEC **Employability Enhancement Courses**
- Mandatory Courses MC
- Lecture L Т Tutorial
- Ρ Practical
- С Credit Point 2
- CIA **Continuous Internal Assessment**
- ESE End Semester Examination
- Total TOT ÷







LIST OF HUMANITIES AND SOCIAL SCIENCES (HS) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit Sek		Maximum Marks			
			L	Τ	Ρ	С	CIA	ESE	TOT		
23HST101	Professional English	HS	3	0	0	3	40	60	100		
23HST102	தமிழர்மரபு/Heritage of Tamils	HS	1	0	0	1	40	60	100		
23HSE201	English for Engineers:Theory and Practice	HS	3	0	2	4	50	50	100		
23CYT201	Environmental Sciences and Sustainability	HS	3	0	0	3	40	60	100		
23HST202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	0	0	1	40	60	100		
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100		

LIST OF BASIC SCIENCES (BS) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maxir	num M	arks
			L	Τ	Ρ	С	CIA	ESE	TOT
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23PHE101	Engineering Physics	BS	3	0	2	4	50	50	100
23CYE102	Chemistry for Engineers	BS	3	0	2	4	50	50	100
23MAT201	Statistics and Numerical Methods	BS	3	1	0	4	40	60	100
23PHT201	Advanced Physics of Materials	BS	3	0	0	3	40	60	100
23MAT304	Transforms and Partial Differential Equations	BS	3	1	0	4	40	60	100







LIST OF ENGINEERING SCIENCES (ES) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Max	iximum Marks		
			L	Т	Ρ	С	CIA	ESE	TOT	
23GEE101	Programming in C	ES	3	0	2	4	50	50	100	
23GET201	Engineering Graphics	ES	3	0	2	4	50	50	100	
23GEL201	Engineering Practices Laboratory	ES	0	0	4	2	60	40	100	
23CEE402	Fluid Mechanics and Machinery	ES	3	0	2	4	50	50	100	
23GEE301	Problem solving using Python Programming	ES	3	0	2	4	50	50	100	

LIST OF PROFESSIONAL CORE (PC) COURSES

Course Code	Name of the Subject	Category	Periods / Week		ls / k	Credit	Max	imum N	/larks
			L	Τ	Ρ	С	CIA	ESE	TOT
23MET201	Manufacturing Processes	PC	3	0	0	3	40	60	100
23MET301	Engineering Thermodynamics	PC	3	1	0	4	40	60	100
23MET302	Engineering Mechanics	PC	3	1	0	4	40	60	100
23MEE301	Manufacturing Technology	PC	3	0	2	4	50	50	100
23MEE302	Metrology and Measurement	PC	3	0	2	4	50	50	100
23MET401	Kinematics of Machinery	PC	3	1	0	4	40	60	100
23MET402	Engineering Materials and Metallurgy	PC	3	0	0	3	40	60	100
23MEE401	Thermal Engineering	PC	3	0	2	4	50	50	100
23MEE402	Strength of Materials	PC	3	0	2	4	50	60	100
23MET501	Design of Machine Elements	PC	3	1	0	4	40	60	100
23MEE501	Dynamics of Machinery	PC	3	0	2	4	50	50	100
23MEE502	Heat and Mass Transfer	PC	3	0	2	4	50	50	100
23MEE601	Finite Element Analysis	PC	3	0	2	4	50	50	100
23MEE602	Mechatronics	PC	3	0	2	4	50	50	100





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

LIST OF PROFESSIONAL ELECTIVE COURSES

Professional Elective - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maxi	mum N	larks
			L	Т	Ρ	С	CIA	ESE	тот
23MEP501	Welding Technology	PE	3	0	0	3	40	60	100
23MEP502	Non-Destructive Testing and Evaluation of Materials	PE	3	0	0	3	40	60	100
23MEP503	Composite Materials	PE	3	0	0	3	40	60	100
23MEP504	Green Manufacturing	PE	3	0	0	3	40	60	100
23MEP505	Unconventional Machining Processes	PE	3	0	0	3	40	60	100
23MEP506	Metal Casting Process	PE	3	0	0	3	40	60	100

Professional Elective - II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maxi	mum N	larks
			L	Т	Р	С	CIA	ESE	тот
23MEP507	Hybrid and Vehicle technology	PE	3	0	0	3	40	60	100
23MEP508	Automobile Engineering	PE	3	0	0	3	40	60	100
23MEP509	Design of Heat Exchangers	PE	3	0	0	3	40	60	100
23MEP510	Computational Fluid Dynamics	PE	3	0	0	3	40	60	100
23MEP511	Refrigration and Air Conditioning	PE	3	0	0	3	40	60	100
23MEP512	Solar Thermal System	PE	3	0	0	3	40	60	100







Professional Elective - III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maxi	mum N	larks
			L	Т	Ρ	С	CIA	ESE	тот
23MEP513	Product Design and Development	PE	3	0	0	3	40	60	100
23MEP514	Computer Applications in Design	PE	3	0	0	3	40	60	100
23MEP515	Fluid Power Systems	PE	3	0	0	3	40	60	100
23MEP516	Process Planning and Cost Estimation	PE	3	0	0	3	40	60	100
23MEP517	Power Plant Engineering	PE	3	0	0	3	40	60	100
23MEP518	Rapid Prototying	PE	3	0	0	3	40	60	100

Professional Elective - IV

Course Code	Name of the Subject	Category	Periods / Week			eriods / ^{tig} Week Geek		Herein Maximum Marks ບັ			
				Т	Ρ	С	CIA	ESE	тот		
23MEP601	CAD/CAM	PE	3	0	0	3	40	60	100		
23MEP602	Design for Manufacturing and Assembly	PE	3	0	0	3	40	60	100		
23MEP603	Lean Manufacturing	PE	3	0	0	3	40	60	100		
23MEP604	Production Planning and Control	PE	3	0	0	3	40	60	100		
23MEP605	Computer Integrated Manufacturing	PE	3	0	0	3	40	60	100		
23MEP606	Flexible Manufacturing System	PE	3	0	0	3	40	60	100		





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Professional Elective - V

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks			
			L	Т	Ρ	С	CIA	ESE	тот	
23MEP607	Engineering Ethics	PE	3	0	0	3	40	60	100	
23MEP608	Instrumentation and control Engineering	PE	3	0	0	3	40	60	100	
23MEP609	Surface Engineering	PE	3	0	0	3	40	60	100	
23MEP610	Maintenance Engineering	PE	3	0	0	3	40	60	100	
23MEP611	Industrial Engineering	PE	3	0	0	3	40	60	100	
23MEP612	Robotics	PE	3	0	0	3	40	60	100	

Professional Elective - VI

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	Т	Р	С	CIA	ESE	тот
23MEP613	Machine Drawing	PE	3	0	0	3	40	60	100
23MEP614	Material Handling and Solid Processing Equipment	PE	3	0	0	3	40	60	100
23MEP615	Design of Jigs and Fixtures	PE	3	0	0	3	40	60	100
23MEP616	Gas Dynamics and Jet Propulsion	PE	3	0	0	3	40	60	100
23MEP617	Design of Transmission Systems	PE	3	0	0	3	40	60	100
23MEP618	Fuel Cells	PE	3	0	0	3	40	60	100





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LIST OF OPEN ELECTIVE COURSES

OPEN ELECTIVES - I

Course Code	Course Name of the Subject Category	Category	Periods / Week		Periods / Week		Periods / Veek O		Haximum Maximum Ma		
			L	Т	Ρ	С	CIA	ESE	тот		
23MEO601	Introduction to Industrial Engineering	OE	3	0	0	3	40	60	100		
23ECO602	Fundamentals of Electronic Devices and Circuits	OE	3	0	0	3	40	60	100		
23EEO603	Electric Vehicle Technology	OE	3	0	0	3	40	60	100		
23EEO604	Renewable Energy System	OE	3	0	0	3	40	60	100		
23MEO605	CNC Machining Technology	OE	3	0	0	3	40	60	100		
23MAO606	Graph Theory	OE	3	0	0	3	40	60	100		
23CEO607	Environmental and Social Impact Assessment	OE	3	0	0	3	40	60	100		
23PMO608	Pharamaceutical Nanotechnology	OE	3	0	0	3	40	60	100		
23RAO609	Fundamentals of Robotics	OE	3	0	0	3	40	60	100		
23CSO610	Introduction to Drone Technologies	OE	3	0	0	3	40	60	100		
23MDO611	Hospital Management	OE	3	0	0	3	40	60	100		
23CSO612	Cyber Forensics and Ethical Hacking	OE	3	0	0	3	40	60	100		







OPEN ELECTIVES – II

Course Code	ourse Name of the Subject Category	Pe	Periods / Week		Periods / Week		Periods / Week		Maximum		mum N	m Marks	
			L	Т	Ρ	С	CIA	ESE	тот				
23HSO701	English for Competitive Examinations	OE	3	0	0	3	40	60	100				
23MGO702	Democracy and Good Governance	OE	3	0	0	3	40	60	100				
23MEO703	Fundamentals of Mechatronics	OE	3	0	0	3	40	60	100				
23CEO704	Remote Sensing Concepts	OE	3	0	0	3	40	60	100				
23MEO704	Nano Technology	OE	3	0	0	3	40	60	100				
23MDO705	Ultrasound Principles and its Medical Applications	OE	3	0	0	3	40	60	100				
23PMO706	Intellectual Property Rights	OE	3	0	0	3	40	60	100				
23RAO707	Concepts in Mobile Robots	OE	3	0	0	3	40	60	100				
23ECO708	Energy Technology	OE	3	0	0	3	40	60	100				
23EEO709	Sensors, Actuators and its Applications	OE	3	0	0	3	40	60	100				
23MAO710	Operations Research	OE	3	0	0	3	40	60	100				
23CSO711	Cyber Security	OE	3	0	0	3	40	60	100				
23MEO712	3D Printing and Design	OE	3	0	0	3	40	60	100				







OPEN ELECTIVES - III

Course Code	Course Name of the Subject Category	Category	Periods / #		Credit	Maxi	mum M	Marks	
			L	Т	Ρ	С	CIA	ESE	тот
23HSO713	Project Report Writing	OE	3	0	0	3	40	60	100
23MAO714	Advanced Numerical Methods	OE	3	0	0	3	40	60	100
23CSO715	Fundamentals of Blockchain Technology	OE	3	0	0	3	40	60	100
23EEO716	Electrical,Electronic and Magnetic Materials	OE	3	0	0	3	40	60	100
23CEO717	Geographical Information System	OE	3	0	0	3	40	60	100
23ECO718	VLSI Design	OE	3	0	0	3	40	60	100
23MDO719	Wearable Technology	OE	3	0	0	3	40	60	100
23MEO720	Marine Vehicles	OE	3	0	0	3	40	60	100
23RAO721	Nanomaterials and Application	OE	3	0	0	3	40	60	100
23MGO722	Cost Management of Engineering Projects	OE	3	0	0	3	40	60	100
23MD0723	Medical Waste Management	OE	3	0	0	3	40	60	100
23MDO724	Lifestyle Diseases	OE	3	0	0	3	40	60	100





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GENERAL ELECTIVES

Course Code	Name of the Subject	Category	Pe	erio Wee	ds / ek	Credit	Maxi	mum Marks	
			L	Т	Ρ	С	CIA	ESE	тот
23NCCL01	NCC AIRFORCE LEVEL - 1	GE	3	0	0	3	40	60	100
23NCCL02	NCC AIRFORCE LEVEL - 2	GE	3	0	0	3	40	60	100
23NCCL03	NCC ARMY LEVEL - 3	GE	3	0	0	3	40	60	100
23NCCL04	NCC ARMY LEVEL - 4	GE	3	0	0	3	40	60	100

ELECTIVE - MANAGEMENT

Course Code	Name of the Subject	Category	Pe	Periods / Geek Week		Maximum I			larks
				Т	Ρ	С	CIA	ESE	тот
23MGT701	Principles of Management	GE	3	0	0	3	40	60	100
23MGT702	Total Quality Management	GE	3	0	0	3	40	60	100
23MGT703	Engineering Economics and Financial Accounting	GE	3	0	0	3	40	60	100
23MGT704	Human Resource Management	GE	3	0	0	3	40	60	100
23MGT705	Knowledge Management	GE	3	0	0	3	40	60	100
23MGT706	Industrial Management	GE	3	0	0	3	40	60	100
23MGT707	Supply Chain Management	GE	3	0	0	3	40	60	100
23MGT708	e-Waste Management	GE	3	0	0	3	40	60	100





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

LIST OF EMPLOYABILITY ENHANCEMENT COURSES

Course Code	Course Name of the Subject Category			Periods / Week			Periods / Week			Maxi	mum N	larks
			L	Т	Р	С	CIA	ESE	тот			
23EEC101	Soft Skills	EEC	1	0	0	1	100	-	100			
23EEC201	Indian Language (Except Mother Tongue) / Foreign Language	EEC	0	0	4	2	100	-	100			
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100			
23EEC401	Online Certification Course	EEC	3	0	0	3	100	-	100			
23EEC501	Industrial Training	EEC	0	0	4	2	100	-	100			
23MEJ601	Project Work - Phase I	EEC	0	0	8	4	60	40	100			
23EEJ701	Project Work - Phase II	EEC	0	0	8	4	60	40	100			
23MEJ801	Product Development	EEC	0	0	12	6	60	40	100			
23EEC801	Internship	EEC	0	0	4	2	100	-	100			

LIST OF MANDATORY COURSES

MANDATORY COURSES - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
					Ρ	С	CIA	ESE	тот
23MDC501	Introduction to Women and Gender Studies	MC	3	0	0	0	-	-	-
23MDC502	Elements of Literature	MC	3	0	0	0	-	-	-
23MDC503	Film Appreciation	MC	3	0	0	0	-	-	-
23MDC504	Disaster Risk Reduction and Management	MC	3	0	0	0	-	-	-
23MDC505	Constitution of India	MC	3	0	0	0	-	-	-

SEC - UG - R2023 / JUNE - 2024 (REVISED)





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MANDATORY COURSES - II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
		L		т	Р	С	CIA	ESE	тот
23MDC601	Well Being with Traditional Practices- Yoga, Ayurveda and Siddha	MC	3	0	0	0	-	-	-
23MDC602	History of Science and Technology in India	MC	3	0	0	0	-	-	-
23MDC603	Political and Economical Thought for a Human Society	MC	3	0	0	0	-	-	-
23MDC604	State,Nation Building and Politics in India	MC	3	0	0	0	-	-	-
23MDC605	Industrial Safety	MC	3	0	0	0	-	-	-





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SCHEME

Credit Summary







CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023 - 2024 onwards)

CREDIT SUMMARY

B.E. MECHANICAL ENGINEERING

Catagory	Credits Per Semester								
Category	I	II	III	IV	V	VI	VII	VIII	Total
HS	4	7	-	-	-	-	3	-	14
BS	12	8	4	-	-	-	-	-	24
ES	4	6	4	4	-	-	-	-	18
PC	-	3	16	15	12	8	-	-	54
PE	-	-	-	-	9	9	-	-	18
GE	-	-	-	-	-	-	3	-	03
OE	-	-	-	-	-	3	6	-	09
EEC	1	2	1	3	2	4	4	8	25
МС	-	-	-		-	-	-	-	-
Total	21	26	25	22	23	24	16	08	165







SEMESTER I

LTPC PROFESSIONAL ENGLISH (Common to all B.E. & B.Tech. Branches) 3003

OBJECTIVES

23HST101

- To develop learning English language through grammar.
- To use grammar efficiently for demonstrating all the four language skills (LSRW). •
- To write business letters, dialogue writing, paragraph and essay writing. •
- To speak effectively about self introduction and real time situation. •
- To build the reading skills through reading comprehension and note taking •

UNIT I VOCABULARY

Synonyms and Antonyms - Word Formation - Sentence Types (declarative, imperative, interrogative & exclamatory) - Single Word Substitutes - Use of Abbreviations and Acronyms- Homonyms and Homophones -Collocation - British and American Vocabulary.

UNIT II GRAMMAR

Parts of speech - Be, Have and Do verbs - Punctuation - Tenses - Numerical Adjectives - modal verbs -Single line Definition - Direct and Indirect Speech - Gerunds and Infinitives - Same Word Used as Different Parts of Speech.

UNIT III WRITING

Letter Writing - Business communications - quotations, placing orders, complaints, replies to queries from business customers - Dialogue Writing – Paragraph Writing (descriptive, narrative, expository & persuasive) -Essay Writing - Writing Instructions.

UNIT IV SPEAKING

Self-introduction - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Expressing opinions and justifying opinions - Agreement / disagreement - Likes and dislikes - Tongue twisters

UNIT V **READING SKILLS**

Comprehension - Reading techniques, pre-reading, post-reading, comprehension questions Reading (multiple choice questions or short questions) - Short Comprehension Passages, practice skimming -Scanning and Predicting - Reading the passage and taking (Note making) Notes - Scan and understand main contents of the passage.

TOTAL: 45 PERIODS

Mandatory activity: Self Introduction



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OUTCOMES

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

- Use a wide range of vocabulary in oral and written communication
- Frame grammatically correct sentences.
- Write letters, frame paragraphs and Essays, develop conversation.
- Develop speaking skills for self-Introduction, delivering speeches and Technical Presentation
- Read and comprehend the passage, technical content and take notes

TEXT BOOKS

- Board of Editors. Using English A Course book for Under graduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2015.
- 2. Richards, C. Jack. Interchange Students' Book 2, 2015.

REFERENCES

- 1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", First Edition, Orient Black Swan, 2012.
- 2. MacMillan, Krishna Mohan, Meera Banerji, Developing Communication Skills, Paperback, 2019.

E-RESOURCES

- 1. http://www.usingenglish.com
- 2. https://www.khanacademy.org/humanities/grammar

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	3	1	2	3	-	3	-	-	-
2	-	-	-	-	-	1	2	-	1	3	-	3	-	-	-
3	-	-	-	-	-	3	3	2	3	3	-	3	-	-	-
4	-	-	-	-	-	1	2	1	2	3	-	3	-	-	-
5	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	-	1.40	2.20	1.25	1.80	3.00	-	3.00	-	-	-

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' - No Correlation





23MAT101

SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS) (Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai) Recognized Under Section 2(1) & 12(B) of the UGC Act, 1956 NAAC Accredited with 'A' Grade TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU MATRICES AND CALCULUS (Common to all B.E./ B.Tech. Branches)



L T P C 3 1 0 4

9+3

9+3

OBJECTIVES

- To develop the use of matrix algebra techniques those are needed by engineers for practical applications.
- To familiarize the students with differential and integral calculus.
- To describe the student with functions of several variables.
- To acquire the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus that is needed for problems in engineering disciplines.

UNIT I MATRICES

Eigen values and Eigen vectors – Properties of Eigen values – Cayley-Hamilton theorem – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of quadratic form.

UNIT II DIFFERENTIAL AND INTEGRAL CALCULUS

Differentiation rules: Derivatives of polynomials and exponential functions – The product and quotient Rules – Derivatives of trigonometric functions – The Chain rule – Implicit differentiation – Applications of differentiation: Maximum and Minimum Values – Techniques of integration: Integration by parts – Trigonometric integrals – Integration of rational functions by partial fractions.

UNIT III FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Homogeneous functions – Euler's theorem – Total derivative – Jacobians –Taylor's theorem for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV MULTIPLE INTEGRALS

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double integrals.

UNIT V VECTOR CALCULUS

Scalar and vector point functions – Gradient – Divergence and curl – Line integral – Surface integral – Green's theorem in a plane – Volume integral – Divergence theorem – Irrotational and Solenoidal fields.

OUTCOMES

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

- Classify the matrix algebra methods for solving practical problems.
- Discover differential calculus tools in solving various application problems and compare different methods of integration in solving practical problems.



9+3

9+3

9+3





- Develop differential calculus ideas on several variable functions.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.
- Solve engineering problems using the concept of vector calculus.

LIST OF TUTORIALS

- 1. Computation of Eigen values and Eigenvectors.
- 2. Calculate differentiation and integration of simple functions.
- 3. Determining Maxima and minima of functions for two variables.
- 4. Evaluating double and triple integrals.
- 5. Computing Gradient, divergence and curl of point functions.

TEXT BOOKS

TOTAL: 45+15 PERIODS

- 1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, Forty Third Edition, 2014.
- 2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, Seventh Edition, 2015.

REFERENCES

- 1. Bali N.P, Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), Seventh Edition, 2009.
- Kanti B. Dutta., "Mathematical Methods of Science and Engineering Aided with MATLAB", Cengage Learning, 2013.

E-RESOURCES

- 1. https://nptel.ac.in/courses/111105121 (Differential Calculus and Integral Calculus)
- 2. https://nptel.ac.in/courses/111107112 (matrix analysis)

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
2	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
3	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
4	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
5	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-

1 - Low 2 - Medium 3 - High '-' - No Correlation




HERITAGE OF TAMILS

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23HST102

Unit - I LANGUAGEAND LITERATURE

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

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

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

Unit- III FOLK AND MARTIAL ARTS

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

Unit- IV THINAI CONCEPT OF TAMILS

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

Unit- V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

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

TOTAL: 15 PERIODS

TEXT BOOKS

- 1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL (in print)
- Social Life of the Tamils The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
- 3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
- 4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)



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BSCIC



- 6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
- 7. 7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

REFERENCE BOOKS

- 1. Heritage of Tamils, Published by : Yes Dee Publishing Pvt Ltd, Chennai
- 2. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) Reference Book.







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தமிழர் மரபு

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> LT PC 1001

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Unit - I மொழி மற்றும் இலக்கியம்

இந்திய மொழி குடும்பங்கள்- திராவிட மொழிகள் -தமிழ் ஒரு செம்மொழி -தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தில் சமய சார்பற்ற தன்மை- சங்க இலக்கியத்தில் பகிர்தல் அறம்- திருக்குறளில் மேலாண்மை கருத்துக்கள் -தமிழ் காப்பியங்கள்- தமிழகத்தில் பௌத்த சமயங்களின் தாக்கம் -பக்தி இலக்கியம் ஆழ்வார்கள் மற்றும் நாயன்மார்கள்- சிற்றிலக்கியங்கள் -தமிழில் நவீன இலயக்யத்தின் வளர்ச்சி -தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

UNIT - II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை 3 நடுகல் முதல் நவீன சிற்பங்கள் வரை -ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினை பொருட்கள் ,பொம்மைகள் -தேர் செய்யும் கலை-சுடுமண் சிற்பங்கள் -நாட்டுப்புற தெய்வங்கள்- குமரி முனையில் திருவள்ளுவர் சிலை-இசை கருவிகள் -மிருதங்கம் ,பறை ,வீணை,யாழ், நாதஸ்வரம் ,தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

UNIT - III நாட்டுப்புறகலைகள் மற்றும் வீர விளையாட்டுகள் 3 தெருக்கூத்து,கரகாட்டம் ,வில்லுப்பாட்டு, கணியான் கூத்து ,ஒயிலாட்டம், தோல்பாவை கூத்து,சிலம்பாட்டம், வளரி ,புலியாட்டம், தமிழர்களின் விளையாட்டுகள்

UNIT - IV தமிழர்களின் திணைகோட்பாடுகள்

தமிழகத்தின் தாவரங்களும், விலங்குகளும் -தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறகோட்பாடுகள்-தமிழர்கள் போற்றிய அறக்கோட்பாடு -சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவு,கல்வியும்- சங்க கால நகரங்களும் துறை முகங்களும் -சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி -கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT - V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு- இந்தியாவின் பிறபகுதிகளில் தமிழ்பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்தமருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிகள் -தமிழ் புத்தகங்களின் வரலாறு

TOTAL: 15 PERIODS







TEXT BOOKS

- தமிழக வரலாறு -மக்களும் பண்பாடும் -கே கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநால் மற்றும் கல்வியியல் பணிகள் கழகம்)
- 2. கணினி தமிழ் -முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்)
- கீழடி -வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
- 4. பொருநை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1. தமிழர் மரபு -முனைவர் ஆ பூபாலன் (வி ஆர்பி பி பப்ளிஷர்ஸ்)







23PHE101

ENGINEERING PHYSICS

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(Common to Civil, Mechanical, R & A and Pharm. Tech)

OBJECTIVES

- To study the structure of crystalline materials using crystallographic knowledge.
- To learn elasticity, placticity, stress, strain behavior of materials for industrial applications.
- To generalize the fundamentals of ultrasonics and sound waves, as well as their applications.
- To explore the complex physical phenomenon using the fundamental principles of quantum mechanics and Schrödinger's wave equation.
- To exhibit different materials heat transmission modes and fundamentals of thermal conduction in solid and its applications.
- To understand the Engineering Physics that can be applied to optics, acoustics and ultrasonic's, matter characteristics and to determine thermal properties.

UNIT I CRYSTAL PHYSICS

Lattice and Unit cell – Crystal Systems and Bravais lattice – Lattice planes – Miller Indices – d -Spacing in Cubic lattice – Calculation of Number of Atoms per Unit Cell – Atomic radius ,Coordination Number, Packing factor for SC, BCC, FCC and HCP structures – Crystal Growth Techniques: Melt Growth Techniques (Bridgman and Czochralski).- Silicon chip Production Process.

UNIT II MECHANICAL PROPERTIES OF SOLIDS & FLUIDS

Elasticity – Stress-Strain Diagram and its Uses - Factors Affecting Elastic Modulus – Torsional Stress and Deformations – Twisting Couple - Torsion Pendulum: Theory and Experiment - Bending of beams - Bending Moment – Cantilever: Theory and Experiment – Non-Uniform Bending: Theory and Experiment - I-Shaped Girders.

UNIT III ACOUSTICS & ULTRASONICS

ACOUSTICS : Classification of Sound – Decibel - Weber Fechner Law- Reverberation-Sabine's formula (Concept only) - Factors affecting Acoustics of Buildings and their Remedies.

ULTRASONICS: Properties -Production of Ultrasonics - Magnetostriction and Piezoelectric methods - Non Destructive Testing – Pulse echo system, through Transmission and Reflection modes.

UNIT IV QUANTUM PHYSICS

Black Body Radiation – Planck's Theory (derivation) – Electron Diffraction – Wave function and its Physical significance – Schrödinger's Wave Equation: Time independent and time dependent equations - Scanning Electron Microscope - Transmission Electron Microscope - Quantum Tunneling & Scanning Tunneling Electron Microscope







UNIT V THERMAL PHYSICS

Transfer of Heat Energy – Thermal expansion of Solids and Liquids – Expansion joints - Bimetallic strips - Thermal Conduction, Convection and Radiation – Heat conductions in Solids – Thermal Conductivity Lee's disc method: Theory and Experiment - Geothermal Energy - Geothermal power - Thermal battery - Thermal Energy Storage.

TOTAL: 45 PERIODS

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OUTCOMES

Upon completion of the course, Students will be able to

- Apply crystallographic knowledge to get familiar with the structure of crystalline solids.
- Analyze theories of failure and yield criteria as an element of properties of matter.
- Understand different materials characterization techniques.
- Apply the basic principles of quantum mechanics and Schrödinger's wave equation to study the complex physical phenomenon.
- Build knowledge about thermal conductivity and its applications.
- Experimentally combine the concepts of thermal, optical, acoustic, and elasticity for use in engineering applications

TEXT BOOKS

- 1. P.Mani, "A Text book of Engineering Physics" Dhanam Publications, 2018.
- 2. Rajendran V. "Engineering Physics". TaTa McGraw Hill Publications, 2016
- 3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw Hill, 2017.

REFERENCES

- 1. Askeland, D. "Materials Science and Engineering". Brooks/Cole, 2010.
- 2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials" Narosa Publishing House, 2009
- 3. K.Thyagarajan and A.Ghatak. "Lasers: Fundamentals and Applications", Laxmi Publications, (Indian Edition), 2019
- 4. D.Halliday, R.Resnick and J.Walker. "Principles of Physics", Wiley (Indian Edition), 2015

E-RESOURSES

- 1. https://archive.nptel.ac.in/courses/122/107/122107035/
- 2. https://archive.nptel.ac.in/courses/115/101/115101107/







LIST OF EXPERIMENTS

(Common to Civil, Mechanical, Robotics & Automation & Pharmaceutical Technology) (Eight experiments are to be conducted in Lab)

- 1. Determination of wavelength of laser.
- 2. Determination of particle Size lycopodium powder using laser.
- 3. Determination of wavelength of mercury spectrum- Spectrometer.
- 4. Determination of Young's modulus Uniform bending.
- 5. Torsional Pendulum: Determination of moment of inertia and rigidity modulus.
- 6. Determination of velocity of ultrasonic in liquid.
- 7. Determination of Viscosity of a liquid –Poiseulle's Method.
- 8. Determination of thermal conductivity of bad conductor using Lee's Disc Apparatus.
- 9. Determination of Specific resistance of a given wire using Carey's Foster's Bridge (Virtual).
- 10. Radiation with Temperature Change Using Stefan's Law. (Virtual)

TOTAL: 15 PERIODS

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
2	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
3	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
4	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
5	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
6	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' - No Correlation







23CYE102

CHEMISTRY FOR ENGINEERS

LTPC 3024

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(Common to CIVIL, MECH, R&A)

OBJECTIVES

- To classify the impurities of water and know the treatment and the conditioning methods for domestic and industrial uses.
- To familiarize the types of fuels, calorific value calculations and characteristics of solid, liquid and gaseous fuels.
- To impart knowledge on principles and instrumentation of spectroscopy and chromatography.
- To provide students with an understanding of different types of energy sources, energy storage devices, and the principles of energy conversion.
- To be familiar with the types of corrosion and control measures and working of batteries.
- To inculcate practical skills in the determination of water quality parameters and instrumental analysis.

UNIT I WATER TECHNOLOGY

Introduction - Characteristics – Hardness – Estimation of hardness by EDTA method – Alkalinity and its estimation - Boiler feed water – Requirements –Boiler troubles (Scale and Sludge) – Internal conditioning (phosphate, calgon and carbonate conditioning methods) – External conditioning – Zeolite process, Demineralization process – Desalination of brackish water by reverse osmosis.

UNIT II FUELS AND COMBUSTION

Fuels: Introduction - Classification of fuels - Coal - Carbonization - Manufacture of metallurgical coke (Otto Hoffmann method) - Petroleum – Manufacture of synthetic petrol (Bergius process) - Knocking - Octane number - Diesel oil - Cetane number –Natural gas - Compressed Natural Gas (CNG) - Power Alcohol and Biodiesel. Combustion of fuels: Introduction - Calorific value - Higher and lower calorific values- Ignition temperature - Explosive range - Flue gas analysis (ORSAT Method).

UNIT III ANALYTICAL CHEMISTRY

Spectroscopy: Electromagnetic spectrum-Absorption of radiation –Electronic, Vibrational and rotational transitions. UV-Visible and IR Spectroscopy-Principles, instrumentation (Block Diagram Only).-Chromatography - General principles - classification - Gas chromatography – High Pressure Liquid Chromatography –Applications.

UNIT IV ENERGY SOURCES AND STORAGE DEVICES

Nuclear Fission – Controlled nuclear fission – Nuclear fusion – Differences between nuclear fission and fusion – Nuclear chain reactions – Nuclear energy – Light water nuclear power plant – Breeder reactor – Solar energy conversion – Solar cells - Wind energy. Batteries - Types of batteries –lead acid battery, lithium-ionbattery Fuel Cells - H 2 -O 2 fuel cell.





UNIT V ELECTROCHEMISTRY, CORROSION AND ITS CONTROL

Introduction- Electrochemical cells, applications of electrochemical series-Reference Electrode- standard calomel electrode, ion selective electrode, glass electrode, Corrosion – Types – Chemical Corrosion – Electrochemical Corrosion (galvanic and differential aeration) – Factors influencing corrosion – Material selection and design aspects-Control methods of corrosion –sacrificial anodic and impressed current cathodic protection.

TOTAL: 45 PERIODS

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OUTCOMES

Upon completion of the course, Students will be able to

- Infer the quality of water and Identify the method of removal of impurities from water for domestic and industrial purpose.
- Illustrate the quality of fuels from its characteristics, to design and develop new combustion systems that are sustainable, efficient, and environmentally friendly.
- Analyze about the interactions of light with matter and the use of analytical techniques to analyze and characterize molecules.
- Recognize different forms of Energy resources and apply them for suitable application in Energy sectors.
- Analyze the causes of corrosion and discuss the control measures and discuss the functions of batteries.
- Determine the water quality parameters and perform quantitative chemical analysis by pH metery, flame photometry, conductometry and potentiometry.

TEXT BOOKS

- 1. Jain P.C and Monika Jain, "Engineering Chemistry", Dhanpet Rai Publishing Company (P) Ltd., 2015.
- 2. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India Pvt Ltd, 2013.
- 3. R.Gopalan, "Analytical Chemistry" Sultan Chand & amp; Sons, Third Edition, 2017.

REFERENCES

- 1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & amp; Company Ltd, 2015.
- 2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, 2012.
- 3. Shobha Ramakrishnan, Banani Mukhopadhyay, "Essentials of Analytical Chemistry" Pearson Education India, 2018.









E-RESOURCES

- 1. https://nptel.ac.in/courses/104105084
- 2. http://library.iitbbs.ac.in/open-access-e-resources.php

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

- 1. Determination of total, temporary & amp; permanent hardness of water by EDTA method.
- 2. Determination of alkalinity in water sample.
- 3. Determination of DO content of water sample by Winkler's method.
- 4. Determination of chloride content of water sample by Argentometric method.
- 5. Determination of strength of given hydrochloric acid using pH meter.
- 6. Estimation of sodium and potassium present in water using flame photometer.
- 7. Conductometric Precipitation Titration using BaCl 2 and Na 2 SO 4.
- 8. Conductometric titration of strong acid vs strong base.
- 9. Estimation of Ferrous ions by Potentiometric Titration.
- 10. Estimation of copper content in the brass by lodometry.

Mapping	of Cos-Po	s & PSOs
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со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	-	1	-	3	-	-	-	-	2	-	-	-
2	1		2	-	1	-	-	-	-	-	-		-	-	-
3	2	2	3	1	1	1	-	-	-	-	-	1	-	-	-
4	1	1	2	1		-	-	-	-	-	-	-	-	-	-
5	2	1	2	1	3	-	1	-	-	-	-	-	-	-	-
6	2	3	-	-	3	-	-	-	-	-	-	-	-	-	-
AVG	1.6	1.6	2.4	1.25	1.8	1	2	-	-	-	-	1.5	-	-	-

1 - Low 2 - Medium 3 - High '-' - No Correlation







23GEE101

PROGRAMMING IN C

(Lab Embedded Theory Course)

LTPC 3024

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OBJECTIVES

- To understand the constructs of C Language.
- To study arrays and strings for developing C programs
- To know the functions and pointers application in C programs •
- To understand the concepts of structures and Union. •
- To understand input/output and file handling in C. •
- To develop programs and applications using C. •

BASICS OF C PROGRAMMING UNIT I

Introduction to programming paradigms – Structure of C program – C programming: Data Types– variables– Storage classes - Constants - Enumeration Constants - Keywords - Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements – Decision making statements Switch statement – Looping statements – Pre-processor directives – Compilation process.

UNIT II **ARRAYS AND STRINGS**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode – Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) – String operations: length, compare, concatenate, copy –Sorting – Selection sort, Insertion sort, Merge sort, quick sort -Searching - linear and binary search.

FUNCTIONS AND POINTERS UNIT III

Introduction to functions: Function prototype, function call, Built-in functions (string functions, math functions) Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions – Pointers - Pointer operators - Arrays and pointers - Example Program: Sorting of names - Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

UNIT IV STRUCTURES AND UNION

Structure – Example Programs – Nested structures – Pointer in Structures – Array of structures -

Example Program using structures and pointers – Self referential structures – Dynamic memory allocation. Union- Storage classes

UNIT V FILE PROCESSING

Files – Operations of File – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.







LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

- 1. Programs using I/O statements, expressions and decision-making construct.
- 2. Write a program to find whether the given year is leap year or Not.
- 3. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
- 4. Check whether a given number is Armstrong number or not?
- 5. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
 - a) 5 if it is a perfect cube.
 - b) 4 if it is a multiple of 4 and divisible by 6.
 - c) 3 if it is a prime number.
- 6. Populate an array with height of persons and find how many persons are above the average height.
- 7. From a given paragraph perform the following using built–in functions:(i)Find the total number of words.(ii)Capitalize the first word of each sentence.(iii)Replace a given word with another word.
- 8. Solve towers of Hanoi using recursion.
- 9. Locate and Display the Contents of an Array using Pointers.
- 10. Generate salary slip of employees using structures and pointers.
- 11. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

TOTAL: 45 +15 = 60 PERIODS

OUTCOMES

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

- Build C programs for simple applications using basic constructs
- Develop C programs using arrays and strings.
- Construct C programs using functions, recursion and pointers
- Implement applications in C using structures.
- Develop applications in C using file processing.
- Develop applications using C programming constructs

TEXT BOOKS

- 1. E.Balagurusamy,"Programming in ANSI C", Tata McGraw Hill, Eighth Edition, 2019.
- 2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2016.







REFERENCES

- 1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
- 2. Juneja, B. L and Anita Seth, "Programming in C", CENGAGE Learning India pvt. Ltd., 2011.

E – RESOURCES

- 1. https://nptel.ac.in/courses/106/105/106105085/ (Introduction to C Programming)
- 2. https://nptel.ac.in/courses/106/106/106106210/ (Stack Operations)

Mapping of Cos-Pos & PSOs

СО	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	2	1	1	1	2	-	3	2	1	2	-
2	2	2	2	1	2	1	1	1	2	-	3	3	2	2	-
3	2	3	2	1	2	1	1	1	2	-	3	2	2	2	-
4	3	2	2	1	3	1	1	1	2	-	3	3	2	2	-
5	2	3	3	1	2	1	2	1	2	-	3	2	2	3	-
6	2	2	3	2	1	2	-	-	2	1	2	2	2	2	-
AVG	2.00	2.33	2.33	1.16	2.00	1.66	1.00	0.83	2.00	0.16	2.83	2.33	1.83	2.16	-

1 - Low 2 - Medium 3 - High '-' – No Correlation





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SEMESTER II

23HSE201 ENGLISH FOR ENGINEERS: THEORY AND PRACTICE LTPC (Common to all B.E. & B.Tech. Branches) 3024 **OBJECTIVES** • To use grammatical components effectively in spoken and written communication. To read and understand technical writing. • To develop skills for writing email, business letters, Job Application Letter and résumé. To write checklist and recommendation. . To speak fluently in real contexts. To acquire presentation skills and interview skills to face challenges in the career. UNIT I GRAMMAR 6 Articles - Prepositions - Conditionals - Subject verb agreement - Error Spotting - Active and Passive voice. UNIT II LISTENING & READING 6 Syllabification – Improving Vocabulary - Reading Newspapers - Listening to Youtube Documentaries -Listening to Podcast - Listening to Motivational Movies. UNIT III WRITING 6 Checklist - Recommendations - Formal letters - inviting guests - acceptance/declining letters UNIT IV BUSINESS WRITING 6 E-mail writing - fixing an appointment, cancelling appointment, paper submission for seminars and conferences - Job Application Letter and Résumé. UNIT V SPEAKING 6 Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging -Suggesting - Comparing and Contrasting - Situational Role-play. LIST OF EXERCISES Stage Dynamics (Body Language and Paralanguage - Presentation) 1. 2. Day today real time speaking exposures – Story narration, simple, general topics and incidents.

- 3. Group Discussion
- 4 Power Point Presentation (Corporate Skills & Public Speaking)
- Loud Reading 5.
- Picture Description 6.
- Interview Skills (Mock Interview & Interview Etiquette) 7.
- **Case Study Report** 8.

OUTCOMES

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

- Use grammar to frame sentences and write sentences.
- Use vocabulary, Read newspaper and demonstrate listening skills effectively.



TOTAL: 45 +15 = 60 PERIODS





- Draft emails, Business Letters, Job application letter and construct Résumé.
- Frame Checklist and Recommendations
- Develop speaking skill for taking part in collaborative task and situational Role-play.
- Demonstrate communication skills effectively in both formal and informal situations

TEXT BOOKS

- 1. S. Sumant, "Technical English" Maven Learning Private Limited,
- 2. Joshi, Manmohan, Soft Skills, Bookboon, First Edition, 2017.

REFERENCES

- 1. Dr K Elango, Dr. Veena Selvam, Dr. Sujatha Priyadarshini, "Resonance English for Engineers and Technologists", Cambridge University Press, First Edition, 2013.
- 2. Seely, John "Oxford Guide to Effective Writing and Speaking", Indian ed., New Delhi, Oxford University Press, 2005.

E-RESOURCES

- 1. https://www.fluentu.com/Blog/english/english-small-talk
- 2. https://www.britishcouncil.com

EXTENSIVE READING

1. Stephen R. Covey, "The 7 Habits of Highly Effective People", Simon & Schuster, 2019.

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	1	-	2	3	-	3	-	-	-
2	-	-	-	-	2	1	1	1	2	3	-	3	-	-	-
3	-	-	-	-	2	1	2	1	2	3	-	3	-	-	-
4	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
5	-	-	-	-	-	2	1	1	3	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	2.00	1.20	1.20	1.00	2.00	3.00	-	3.00	-	-	-

1 - Low 2 - Medium 3 - High '-' – No Correlation

Course Assessment methods for Continuous Internal Assessment:

S.No.	Assessment	Method	Marks
1.	Continuous Internal Assessment 1	Theory	50
2.	Continuous Internal Assessment 2	Practical	50
3.	Continuous Internal Assessment 3	Theory	50

During Practical (50 Marks)

- Speaking test will be conducted for 20 marks
- Reading test will be conducted for 20 marks
- Listening test will be conducted for 10 marks





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23MAT201

STATISTICS AND NUMERICAL METHODS

(Common to Mechanical, R&A and PT)

L T P C 3 1 0 4

OBJECTIVES

- To provide the necessary basic concepts in testing of hypothesis for small and large samples which plays an important role in real life problems.
- To acquaint the knowledge of classifications of design of experiments.
- To extend the basic concepts of solving algebraic and transcendental equations.
- To apply the numerical techniques of interpolation and integration.
- To produce the knowledge of various techniques in solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS

Sampling distribution – Testing of significance for single proportion, single mean and difference of means – Test of significance for small samples by 't' test – Snedecor's F- test of significance – Chi-square test : Chi-square test of goodness of fit – Independent of attributes.

UNIT II DESIGN OF EXPERIMENTS

Basic principles of experimental design – Completely randomised design – Analysis of variance for one way classification – Randomised block design – Analysis of variation for two factor experiments variations – Latin square design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

Solution of algebraic and transcendental equations by Newton Raphson method – Solution of simultaneous algebraic equations by Gauss elimination, Gauss Jordan and Gauss Seidel methods – Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method.

UNIT IV INTERPOLATION AND NUMERICAL INTEGRATION

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's interpolation formula – Newton's divided difference formula – Numerical integration by Trapezoidal and Simpson's 1/3 rule – Numerical double integration by Trapezoidal rule.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Euler's method – Modified Euler's method – Fourth order Runge - Kutta method for solving first order equations – Taylor's series method – Predictor-corrector methods: Milne's method – Adams-Bash forth method.

OUTCOMES

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

- Analyze the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Summarize the numerical techniques of interpolation in various intervals and apply the numerical techniques of integration for engineering problems.
- Produce various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial conditions by using certain techniques with engineering applications.



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9+3

9+3

9+3

9+3





LIST OF TUTORIALS

- 1. Solving one sample and paired sample't' test.
- 2. Determination of roots of a polynomial.
- 3. Solution of linear system of equations by Gauss Seidel methods.
- 4. Evaluation of line integrals by Trapezoidal rule.
- 5. Solution of ordinary differential equations by Euler's method.

TEXT BOOKS

TOTAL: 45+15 PERIODS

- 1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, Tenth Edition, 2015.
- 2. Dr.Kandasamy. P, Dr.Thilagavathy . K and Dr. Gunavathy .K., "Statistics and Numerical Methods", S. Chand and Company Ltd., 2010.

REFERENCES

- 1. Burden, R.L and Faires, J.D, "Numerical Analysis", Cengage Learning, Nineth Edition, 2016.
- 2. Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, Twelveth Edition, 2020.

E-RESOURCES

- 1. https://nptel.ac.in/courses/111/105/111105041/ (Statistics)
- 2. https://nptel.ac.in/courses/111/107/111107105/ (Numerical Methods)

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
2	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
3	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
4	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
5	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-

1 - Low 2 - Medium 3 - High '-' – No Correlation





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23PHT201

ADVANCED PHYSICS OF MATERIALS

L T P C 3003

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(Common to Civil, Mechanical, R & A and Pharm.Tech)

OBJECTIVES

- To learn the principles of cryogenics and superconductivity and applications.
- To know the application of physics concepts to microscopic and NDT Testing.
- To understand different kind of nano materials and synthesis of nano materials, applications.
- To acquire the knowledge of advanced and smart materials for various engineering applications.
- To study different composite materials and synthesize methods.

UNITI CRYOGENICS

Introduction to Cryogenics - Properties of Cryogenic Fluids- Gas-Liquefaction of Gases and Refrigeration Systems – Cryocoolers -Cryogenic Insulations - Superconductivity: Properties – Type I and Type II Superconductors – BCS theory of Superconductivity - High tc superconductors – General applications of Superconductors.

UNIT II MATERIALS CHARACTERIZATION

Introduction to materials and Techniques-X-Ray Diffraction (XRD) – Atomic Force Microscopy (AFM)- Fourier Transform Infrared Spectroscopy (FTIR)- UV-Vis Spectroscopy- Non-Destructive Testing (NDT) : Liquid Penetrant Test, Magnetic Detection, Electromagnetic Testing, Ultrasonic Test.

UNIT III NANOMATERIALS & NANODEVICES

Emergence of Nano science - Role of Particle Size - Quantum Structures: Quantum Well, Quantum Wire and Quantum Dot- Properties at Nano Scale (Optical, Electronic and Magnetic) - Synthesis of Nanomaterials: Physical Vapour Deposition (PVD) - Pulsed Laser Deposition (PLD) - Carbon Nanotubes: Types, Properties and applications - Micro Electro Mechanical Systems (MEMS)

UNIT IV SMART MATERIALS

Smart materials – Functional materials – Polyfunctional Materials – Structural Materials, Electrical Materials, Bio-Compatible Materials - Metallic Glasses: Types, Glass forming ability of Alloys, Melt spinning process, Applications - Shape Memory Alloys: Phases, Shape Memory Effect, Pseudo elastic effect, NiTi alloy, and applications.

UNIT V COMPOSITE MATERIALS

Definitions, Composites, Reinforcements and Matrices, Types of Reinforcements, Types of Matrices, Types of Composites, Carbon Fibre Composites, Properties of Composites in Comparison with Standard Materials, Applications of Metal, Ceramic and Polymer matrix composites.

TOTAL: 45 PERIODS







OUTCOMES

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

- Analyze the potential applications of superconductors.
- Develop knowledge on various materials characterization techniques.
- Discuss the fundamentals of nano materials and various synthesize methods.
- Develop knowledge about smart materials and their applications.
- Design methodologies and develop the principles of composite materials.

TEXT BOOKS

- 1. P.Mani, "A Text book of Engineering Physics" Dhanam Publications, 2018
- 2. Rajendran V. "Engineering Physics". Tata McGraw Hill Publications, 2017.
- 3. Sam Zhang, Lin Ki, Ashok Kumar, "Materials Characterization Techniques", CRC Press, Taylor & Francis Group, 2019.

REFERENCES

- 1. Askeland, D. "Materials Science and Engineering". Brooks/Cole, 2015.
- 2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials" Narosa Publishing House, 2017.
- 3. P.Santhana Ragavan and P. Ramasamy, "Crystal Growth Processes and Methods", KRU Publications, 2017.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112108150/
- 2. https://swayam.gov.in/nd1_noc19_mm13/preview

Mapping of COs-POs & PSOs

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	2	3	2	1	2	1	1	-	-	-	-	-	-	-	-
2	2	3	2	1	2	1	1	-	-	-	-	-	-	-	-
3	2	3	2	1	2	1	1	-	-	-	-	-	-	-	-
4	2	3	2	1	1	1	1	-	-	-	-	-	-	-	-
5	2	3	2	1	2	1	1	-	-	-	-	-	-	-	-
AVG	2	3	2	1	1.8	1	1	-	-	-	-	-	-	-	-

1 - Low 2 - Medium 3 - High '-' – No Correlation





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23CYT201

ENVIRONMENTAL SCIENCE AND SUSTAINABILITY (Common to All B.E /B.Tech Branches) L T P C 3 0 0 3

OBJECTIVES

- To understand the importance of the environment, ecosystem, biodiversity and its conservation.
- To study various kinds of pollutions, solid waste management and precautionary measures for disasters.
- To learn the social issues and identify the possible way to improve the quality of the environment.
- To understand the problems of overpopulation and understand the value education.
- To know the concept of sustainability and implement sustainable practices in various fields.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of environment – Need for public awareness - Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) aquatic ecosystems (oceans) – Introduction to biodiversity definition: genetic, species and ecosystem diversity –Value of biodiversity – Threats to biodiversity – Endangered and endemic species of India – Conservation of biodiversity: In-Situ and Ex-Situ conservation of biodiversity.

Activity: Biodiversity in and around the campus and report submission.

UNIT II ENVIRONMENTAL POLLUTION

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution – Solid waste management: causes, effects and control measures of municipal solid wastes - E-waste – Role of an individual in prevention of pollution - Pollution case studies – Disaster management: floods, earthquake and cyclone.

Activity: Local pollution case study and report submission.

UNIT III SOCIAL ISSUES AND THE ENVIRONMENT

Water conservation, rain water harvesting, watershed management – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Green Chemistry and principles - Environment production act – Air (Prevention and Control of Pollution) act –Water (Prevention and control of Pollution) act

Activity: Creating environmental awareness.

UNIT IV HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health – Case studies.

Activity: Visit to local primary health center.



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UNIT V SUSTAINABLE MANAGEMENT

Sustainability-Concept, needs and challenges-economic, social and aspects of sustainability- From unsustainability to sustainability- -Sustainable Development Goals-Targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-Case studies. Zero waste, Material Life cycle assessment, Sustainable habitat: Energy efficiency, Sustainable transports.

Activity: Field trips to local organizations or facilities with sustainable practices in place.

TOTAL: 45 PERIODS

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OUTCOMES

Upon completion of the course, Students will be able to

- Apply knowledge on public awareness & amp; about the environment, ecosystem and biodiversity.
- Find solutions for pollutions and waste management to improve the quality of environment.
- Identify the causes of social issues and apply the concept of green chemistry to maintaining a clean environment.
- Analyze the effects of human population and issues related to the environment and human health.
- Identify with the different goals of sustainable development and apply them for suitable technological advancement and societal development.

TEXT BOOKS

- 1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, 2019.
- 2. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Pearson Education, Eighth Edition, 2021.
- Allen, D. T. and Shonnard, D. R., "Sustainability Engineering: Concepts, Design and Case Studies", Prentice Hall, Third Edition, 2018.

REFERENCES

- 1. Erach Bharucha, "Textbook of Environmental Studies", Universities Press (I) Pvt Ltd, 2016.
- 2. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, 2018.
- 3. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2019.

E-RESOURCES

- 1. https://nptel.ac.in/courses/122102006/
- 2. https://swayam.gov.in/nd1_noc19_ge22/preview







	pping			<u> </u>												
	со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	1	-	1	3	2	-	1	3	-	1	-	-	1	-	-	-
	2	2	2	2	2	2	2	1	-	-	-	-	-	-	-	-
	3	-	2	2	2	1	1	3	-	-	-	-	-	-	-	-
	4	1	2	2	1	1	2	3	3	-	-	-	-	-	-	-
	5	-	2	2	2	2	1	1	1	-	2	-	-	-	-	-
Ī	AVG	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-

Mapping of COs-POs & PSOs

1 - Low 2 - Medium 3 - High '-' - No Correlation







23MET201

MANUFACTURING PROCESSES

L T P C 3 0 0 3

OBJECTIVES

- To study the sand casting for a two part mould is to remove the pattern without breaking the mould cavity and ready to be filled with the molten metal.
- To understand various welding processes and to be familiarize with welding standards, weldability of different materials.
- To understand modern forging machine driven impact hammers or presses which deform the work piece by controlled pressure.
- To know the sheet metal forming involves a wide range of processes that manufacture parts for a vast amount of purposes, both seen and unseen.
- To understand the manufacturing of plastic materials, their properties, applications, processing & quality control, and recycling through theory as well as practical training.

UNIT I METAL CASTING PROCESSES

Sand casting - Sand moulds - Type of patterns - Pattern materials - Pattern allowances - Types of moulding sand - Properties - Core making - Methods of Sand testing - CO₂ process - moulding machines - Working principle of special casting processes - Shell, investment casting - Pressure die casting - Centrifugal casting - Sand Casting defects.

UNIT II METAL JOINING PROCESSES

Introduction to welding processes - Principle of Gas welding and arc welding. Principle of Resistance welding, Gas metal arc welding, submerged arc welding, Tungsten Inert Gas welding, Thermit welding and Electron beam welding- Welding defects.

UNIT III BULK DEFORMATION PROCESSES

Hot working and cold working of metals - Forging processes - Open and closed die forging - Characteristics of the process - Rolling of metals - Types of Rolling mills - Flat strip rolling - Shape rolling operations - Defects in rolled parts - Principle of rod and wire drawing.

UNIT IV SHEET METAL FORMING PROCESSES

Sheet metal characteristics - Typical shearing operations, bending and drawing operations - Stretch forming operations. Working principle and application of special forming processes - Hydro forming - Rubber pad forming - Metal spinning - Explosive forming - Magnetic pulse forming - Peen forming - Super plastic forming.

UNIT V PROCESSING OF PLASTIC COMPONENTS

Types of plastics - Characteristics of the forming and shaping processes - Moulding of Thermoplastics -Working principles and applications of Injection moulding - Plunger and screw machines - Compression moulding - Transfer moulding - Blow moulding - Rotational moulding - Film blowing - Extrusion -Thermoforming - Bonding of Thermoplastics.

TOTAL: 45 PERIODS



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OUTCOMES

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

- Categorize metal casting processes, associated defects, merits and demerits.
- Classify the different metal joining processes.
- Summarize various hot working and cold working methods of metals.
- Analyze the various sheet metal making processes.
- Classify the methods of manufacturing plastic components.

TEXT BOOKS

- Hajra Choudhury S. K, "Elements of Workshop Technology", Vol. II, Media Promoters & Publishers Pvt Ltd., Fifteenth Edition, 2023
- Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India, Eighth Edition, 2020.

REFERENCES

- 1. Rao P.N, "Manufacturing Technology Metal Cutting and Machine Tools", Tata McGraw Hill Publishing Company Pvt Ltd., Fourth Edition, 2020.
- Roy. A. Lindberg, "Processes and Materials of Manufacture", PHI / Pearson education, Sixth Edition, 2020.

E-RESOURCES

- http://nptel.ac.in/courses/1121 05126/ Rao P.N, "Manufacturing Technology Metal Cutting and Machine Tools"
- 2. https://freevideolectures/A0dTvf_Q8BA / Prof.A.B.Chattopadhyay, "Manufacturing Process"

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
2	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
3	2	1	1	-		1	2	-	-	-	1	1	2	1	2
4	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
5	2	1	1	-		1	2	-	-	-	1	1	2	1	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' - No Correlation







23HST202

TAMILS AND TECHNOLOGY

UNIT I WEAVING AND CERAMIC TECHNOLOGY

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

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

UNIT III MANUFACTURING TECHNOLOGY

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

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

TOTAL: 15 PERIODS

TEXT BOOKS

- 1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL (in print)
- 2. Social Life of the Tamils The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
- 3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
- 4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
- 5. Keeladi 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)



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LTPC 001

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7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

SENGUNTHAR ENGINEERING COLLEGE

(AUTONOMOUS)

REFERENCE BOOKS

- 1. Heritage of Tamils, Published by: Yes Dee Publishing Pvt Ltd, Chennai
- 2. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) Reference Book.





23HST202

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<u>தமிழரும் தொழில்நுட்பமும்</u>

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அலகு l <u>நெசவு மற்றும் பானைத் தொழில்நுட்பம்</u>:

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

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: அலகு II 3 சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் மாமல்லபுரச் சிற்பங்களும், கோவில்களும் சோமர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III <u>உற்பத்**தித் தொழில் நுட்பம்**:</u>

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

அலகு IV <u>வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்</u>: 3 அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V <u>அறிவியல் தமிழ் மற்றும் கணித்தமிழ்</u>: 3 அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL: 15 PERIODS

TEXT BOOKS

- தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடதால் மற்றும் கல்வியியல் பணிகள் கழகம்).
- 2. கணினித் தமிழ் முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).







- கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
- 4. பொருநை ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1.தமிழரும் தொழில்நுட்பமும், முனைவர் கே பூபாலன் வி ஆர் பி பப்ளிஷர்ஸ்





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23GET201

ENGINEERING GRAPHICS

(Common to Mech, Civil and Robotics Department)

L T P C 3 1 0 4

9+3

9+3

9+3

9+3

9+3

OBJECTIVES

- To understand the principles in graphic skill to communicate the concepts, ideas and design of engineering components.
- To learn projections of points, lines, planes viewed in different positions.
- To learn the projection of solids viewed in different positions.
- To understand the concepts of section of solids and development of surfaces of the given solids.
- To understand the viewing perception of a solid object in orthographic and Isometric projections

UNIT I PLANE CURVES

Principles of Engineering Graphics and their significance, usage of Drawing instruments, Types of Lines, Dimensioning Systems as per BIS conventions. **(Not for Examination)**

Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

UNIT III PROJECTION OF SOLIDS

Projections of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SIMPLE SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of simple solids like prisms and cone - Inclined to one reference plane. Development of lateral surfaces of simple and truncated solids: pyramids and cylinders.

UNIT V ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS

Conversion of isometric projection into orthographic projection, Conversion of orthographic projection into isometric projection.

TOTAL: 45+15=60 PERIODS

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

- Construct multiple views of engineering components.
- Construct the pictorial drawings as per the standards.
- Develop the projection of solids.
- Draw the section of solids drawings and development of surfaces of given objects.
- Apply free hand sketching and concept of isometric in engineering practice.

OUTCOMES







TEXT BOOKS

- 1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, Fourth Edition, 2019.
- 2. Natarajan K.V., "Engineering Graphics", Dhanalakshmi Publishers, Thirty Second Edition, 2019.

REFERENCES

- K.R. Gopalakrishna, "Engineering Drawing Volume 1 & 2", Subhas Publications, Thirteenth Edition, 2021.
- 2. T.Jeyapoovan. "Engineering Graphics using Auto CAD" Vikas publishing house Pvt Ltd, Sixth Edition, 2022.

E- RESOURCES

- 1. https://nptel.ac.in/courses/112/103/112103019/ (Geometric Constructions)
- 2. https://nptel.ac.in/courses/105/104/105104148/ (Projections)

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
2	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
3	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
4	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
5	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' - No Correlation







23GEL201 ENGINEERING PRACTICES LABORATORY

LTPC 0042

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BSCIC

COURSE OBJECTIVES

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

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

PART I CIVIL ENGINEERING PRACTICES PLUMBING WORK:

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

WOOD WORK:

- a) Sawing,
- b) Planning and
- c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

- a) Studying joints in door panels and wooden furniture
- b) Studying common industrial trusses using models.





PART II

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ELECTRICAL ENGINEERING PRACTICES

- a) Introduction to switches, fuses, indicators and lamps Basic switch boardwiring with lamp, fan and three pin socket
- b) Staircase wiring
- c) Fluorescent Lamp wiring with introduction to CFL and LED types.
- d) Energy meter wiring and related calculations/ calibration
- e) Study of Iron Box wiring and assembly
- f) Study of Fan Regulator (Resistor type and Electronic type using Diac / Triac / quadrac)
- g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES WELDING WORK

15

15

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

BASIC MACHINING WORK

- a) (simple)Turning.
- b) (simple)Drilling.
- c) (simple)Tapping.

ASSEMBLY WORK

- a) Assembling a centrifugal pump.
- b) Assembling a household mixer.
- c) Assembling an air conditioner.

SHEET METAL WORK

a) Making of a square tray

FOUNDRY WORK

a) Demonstrating basic foundry operations.





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PART IV ELECTRONIC ENGINEERING PRACTICES

SOLDERING WORK

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY

- a) Study an elements of smart phone..
- b) Assembly and dismantle of LED TV.
- c) Assembly and dismantle of computer/ laptop

TOTAL: 30 PERIODS

15

COURSE OUTCOMES:

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

- **CO1**: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
- **CO2**: Wire various electrical joints in common household electrical wire work.
- **CO3**: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
- **CO4**: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

Mapping of Cos-Pos & PSOs

со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
2	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
3	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
4	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
5	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
6	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
AVG	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1

1 - Low 2 - Medium 3 - High '-' – No Correlation





SEMESTER III

23MAT304 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L P T C

[Common to Civil, Mech, R&A and PT]

3104

OBJECTIVES

- To study the Fourier transforms techniques which are used in wide variety of situations.
- To learn the effective mathematical tools to develop Z transform techniques for discrete time systems.
- To know the Fourier series analysis in engineering to solve boundary value problems.
- To study the basic concepts of partial differential equation for solving standard partial differential equations.
- To acquire the Fourier series analysis which is used in applications of partial differential equations

UNIT I FOURIER TRANSFORMS

Statement of Fourier integral theorem – Fourier transform – Fourier sine and cosine transforms – Properties of Fourier transform – Convolution theorem for Fourier transform – Parseval's identity for Fourier transform.

UNIT II Z-TRANSFORMS AND DIFFERENCE EQUATIONS

Z-transforms: Some standard Z-transforms – Elementary properties – Some useful Z- transforms and inverse

Z- transforms – Convolution theorem – Evaluation of Inverse Z-transforms by partial fraction method – Application to difference equations.

UNIT III FOURIER SERIES

Euler's formulae – Conditions for a Fourier expansion – Functions having points of discontinuity – Odd and even function – Half range series – Parseval's formula – Practical Harmonic analysis.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients of homogeneous types.

UNIT V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of partial differential equations – Method of separation of variables – Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.



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OUTCOMES

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

- Analyze some of the physical problems of engineering by Fourier transforms.
- Apply Z transforms techniques in solving difference equation.
- Solve differential equations using Fourier series analysis.
- Develop the standard types of partial differential equations.
- Construct the Fourier series techniques in application of partial differential equations.

LIST OF TUTORIALS

- 1. Calculate Fourier transform of simple functions.
- 2. Solve difference equations by Z transforms.
- 3. Computation of Fourier series coefficient.
- 4. Solve partial differential equations.
- 5. Classification of partial differential equations.

TOTAL: 45+15 PERIODS

TEXT BOOKS

- 1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, Forty fourth Edition, 2022.
- 2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G., "Advanced Mathematics for Engineering Students", S.Viswanathan Publishers, Fourth Edition, 1998.

REFERENCES

- 1. N.P. Bali. and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Pvt. Ltd, Nineth Edition, 2014.
- 2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, Tenth Edition, 2016.

E-RESOURCES

- 1. https://archive.nptel.ac.in/courses/111/102/111102129/# (Transforms)
- 2. https://archive.nptel.ac.in/courses/111/103/111103021/ (Partial differential equations)

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	2	-	-	-	-	-	2	3	-	-	-
2	3	3	2	2	2	-	-	-	-	-	2	3	-	-	-
3	3	3	2	2	2	-	-	-	-	-	2	3	-	-	-
4	3	3	2	2	2	-	-	-	-	-	2	3	-	-	-
5	3	3	2	2	2	-	-	-	-	-	2	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	2	2	2	-	-	-	-	-	2	3	-	-	-

1 - Low 2 - Medium 3 - High '-' – No Correlation





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23MET301

ENGINEERING THERMODYNAMICS

(Use of Standard Refrigerant Tables and Chart Data Book and Steam Table is Permitted)

OBJECTIVES

- To understand the fundamentals of thermodynamics and basic conversion principles of mass and energy to closed and open systems
- To learn the laws of thermodynamics. •
- To understand the thermodynamic properties and properties of pure substance.
- To study the concept of thermodynamic relations.
- To learn the basic concept of psychrometry.

BASIC CONCEPTS AND FIRST LAW UNIT I

Basic concepts - Concept of continuum, comparison of microscopic and macroscopic approach Thermodynamic systems - Closed, open and isolated - Thermodynamic equilibrium state, path and process -Quasi-static, reversible and irreversible processes - Heat and work transfer, Zeroth law of thermodynamics and First law of thermodynamics - Application to closed and open systems - Steady and unsteady flow processes.

SECOND LAW OF THERMODYNAMICS AND CONCEPT OF ENTROPY UNIT II

Heat Reservoir, source and sink - Heat Engine, Refrigerator, Heat pump - Second law of themodynamics -Kelvin - Planck and Clausius statements - Carnot cycle Reversed Carnot cycle, Performance - Clausius inequality - Concept of entropy, entropy change for - Pure substance, ideal gases, principle of increase in entropy. Basic concept of availability.

UNIT III PROPERTIES OF PURE SUBSTANCE

Properties of pure substance, thermodynamic properties of pure substance in solid, liquid and vapour phases, phase rule, Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Thermodynamic properties of steam. Calculations of work done and heat transfer in non flow and flow processes. Determination of steam quality.

UNIT IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS

Properties of Ideal gas - Ideal and real gas comparison - Equations of state for ideal and real gases. Compressibility factor and Compressibility chart and its use. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation.

UNIT V **PSYCHROMETRY**

Psychrometric - Properties, charts. property calculations of air vapour mixtures by using chart and expressions - Psychrometric process - Adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing.

TOTAL: 45+15=60 PERIODS



9+3

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OUTCOMES

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

- Explain the fundamental concepts and definitions, thermodynamic principles to Engineering problems.
- Describe the second law of thermodynamics and availability analysis.
- Examine the properties of pure substance and explain the working of steam power cycle.
- Discuss the thermodynamic relation, ideal and real gas behavior.
- Compare the effects of different psychrometric processes on air properties.

TEXT BOOKS

- 1. Nag.P.K., "Engineering Thermodynamics", Sixth Edition, Tata McGraw-Hill, 2017.
- 2. Cengel. Y and M.Boles, "Thermodynamics An Engineering Approach", Nineth Edition, Tata McGraw Hill, 2019.
- 3. Rajput.R.K, "A Textbook of Engineering Thermodynamics", Nineth Edition, Laxmi Publications, 2017.

REFERENCES

- 1. Arora C.P, "Refrigeration and Air Conditioning", Tata McGraw-Hill, Fourth Edition, 2020.
- 2. Natarajan E., "Engineering Thermodynamics: Fundamentals and Applications", Anuragam publications, 2019.
- 3. Holman.J.P, "Thermodynamics", McGraw Hill Education, Tenth Edition, 2019.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/105/112105266/ (Concepts of Thermodynamics
- 2. https://nptel.ac.in/courses/112/104/112104113/ (Basics of Thermodynamics)

	<u> </u>														
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1
2	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1
3	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1
4	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1
5	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	3	3	3	-	-	-	-	-	-	3	3	3	1

Mapping of Cos-Pos & PSOs





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23MET302

ENGINEERING MECHANICS

(Common to Mechanical Engineering and Robotics and Automaton Engineering) OBJECTIVES

- To understand the definition of particle, body, force and their equilibrium conditions.
- To understand the concept of equilibrium of rigid bodies.
- To learn the basic concepts of friction.
- To learn about the center of gravity and moment of inertia of surfaces.
- To study the basic dynamics concepts force, momentum, and impact of elastic bodies.

UNIT I FUNDAMENTAL CONCEPTS OF MECHANICS

Introduction to mechanics – Scalars & vectors - Unit conversion – Laws of Mechanics (Parallelogram law, Lami's theorem and Triangular law of forces) – Types of forces acting on a body - Resolution and composition of force – Free body diagram – Equilibrium of a particle - Equivalent system of forces and computation of resultant forces – Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES

Introduction - Varignon's theorem - Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Resolution of a given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNIT III FRICTION

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – Angle of Repose – Equilibrium of bodies on inclined plane - Belt friction – Ladder friction – Wedge friction – Rolling resistance.

UNIT IV CENTRIODS AND AREA MOMENT OF INERTIA

Introduction – Centroids of simple Plane Areas and Curves (rectangle, triangle, circle, hollow circle, T-section & I-section) – Area moment of inertia for rectangle, circle, hollow circle, triangle, I-Section and T-Section - Parallel axis theorem and Perpendicular axis theorem. Principle moments of inertia of plane areas.

UNIT V DYNAMICS OF PARTICLES

Kinematics - Rectilinear Motion and Curvilinear Motion of particles. Principle of Impulse and Momentum -Impact of elastic bodies.

OUTCOMES

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

- Illustrate the vector and scalar representation of forces and moments
- Analyze the rigid body in equilibrium.
- Determine the friction and the effects by the laws of friction.
- Solve the moment of inertia of the structural members.
- Apply the principles of dynamics to study the motion of a body.



9+3

TOTAL: 45+15=60 PERIODS





TEXT BOOKS

- 1. Dr.N.Kottiswaran, "Engineering Mechanics", Sri Balaji Publications, Eleventh Edition, 2018.
- 2. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education, Twelfth Edition, 2019.
- 3. Vela Murali, "Engineering Mechanics", Oxford University Press, Second Edition, 2018.

REFERENCES

- 1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", Eleventh Edition, Pearson Education, 2017.
- 2. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, Nineth Edition, Wiley student edition, 2019.
- 3. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, Fifth Edition, McGraw Hill Higher Education, 2020.

E-RESOURCES

- 1. https://nptel.ac.in/courses/122/104/122104015/ ((Engineering Mechanics)
- https://www.courses.com/indian-institute-of-technology-guwahati/engineering-mechanics (Engineering Mechanics)

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	2	-	-	-	-	-	-	2	3	1	2
2	3	2	2	1	2	-	-	-	-	-	-	2	3	1	2
3	3	2	2	1	2	-	-	-	-	-	-	2	3	1	2
4	3	2	2	1	2	-	-	-	-	-	-	2	3	1	2
5	3	2	2	1	2	-	-	-	-	-	-	2	3	1	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	2	1	2	-	-	-	-	-	-	2	3	1	2

Mapping of Cos-Pos & PSOs





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23MEE301

MANUFACTURING TECHNOLOGY

LTP C 3 0 2 4

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OBJECTIVES

- To know the mechanism of chip formation in machining, cutting tool materials, tool life and cutting fluids.
- To understand the working of lathe and milling machine.
- To understand the working of shaping, planning, slotting and different drilling operations.
- To learn the process parameters in grinding operations, finishing operations and gear generations.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming.
- To study and practice the moulding processes techniques, various operations that can be performed in lathe, Milling, shaping machines, CNC part programming and their techniques.

UNIT I THEORY OF METAL CUTTING

Mechanism of chip formation - Orthogonal and Oblique cutting - Machining forces - Merchant's Circle Diagram- Thermal aspects of metal machining - Cutting fluids - machinability - Cutting tool materials - Tool wear - Tool life calculations.

UNIT II LATHE AND MILLING MACHINE

Lathe machine - Centre lathe, tool nomenclature, operations, machining time and power estimation - Milling - Specifications - Types - Cutter nomenclature - Operations - Milling processes - Indexing - Gear forming.

UNIT III MACHINE TOOLS AND HOLE MAKING

Types, Specification and Quick return Mechanisms: Shaper, Planer and Slotter - Hole making operations - drilling, reaming, boring, counter boring, counter sinking and tapping.

UNIT IV GRINDING AND GEAR GENERATION

Grinding - Types of grinding - Grinding wheel designation and selection - Honing, lapping, super finishing, polishing and buffing - Gear generation - Gear shaping and gear hobbing - Specifications - Cutting spur and helical gears.

UNIT V CNC MACHINING

Numerical Control (NC) machine tools - CNC types, constructional details, special features, machining centre, part programming fundamentals CNC - Manual part programming - Micromachining - Wafer machining.

LIST OF EXPERIMENTS

- 1. Mould with solid and split patterns.
- 2. Mould with loose-piece pattern.
- 3. Perform facing, plain turning and step turning operations in centre lathe.
- 4. Perform taper turning, thread cutting and knurling operations in centre lathe.
- 5. Fabrication of simple structural shapes using arc welding.
- 6. Spur gear/contour cutting in milling machine.
- 7. Prepare good surface finish on flat metal.
- 8. Round to square in shaper.
- 9. CNC part Programming using CNC lathe and CNC milling machine.
- 10. Cylindrical grinding

TOTAL: 45+15=60 PERIODS







OUTCOMES

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

- Describe the fundamentals of metal cutting in machining operations
- Explain the function of each component in both a lathe and a milling machine.
- Analyze various machining processes such as shaping, milling and gear cutting.
- Describe how these parameters affect the quality and efficiency of the machining process.
- Summarize numerical control of machine tools operations and write a part program.
- Identify various moulding processes techniques, welding and various operations that can be
- performed in lathe machines, milling and shaper.

TEXT BOOKS

- 1. Rajput R. K, "Manufacturing Technology", Laxmi Publications (P) Ltd., Third Edition, 2021.
- 2. Richard R Kibbe, John E Neely, Roland O Merges and Warren T White, "Machine Tool Practices", Prentice Hall of India, Tenth Edition, 2020.

REFERENCES

- Hajra Choudhury S. K, "Elements of Workshop Technology", Vol. II, Media Promoters & Publishers Pvt Ltd., Fifteenth Edition, 2023
- 2. Rao P.N, "Manufacturing Technology Metal Cutting and Machine Tools", Tata McGraw Hill Publishing Company Pvt Ltd., Fourth Edition, 2020

E-RESOURCES

- http://nptel.ac.in/courses/1121 05126/ Rao P.N, "Manufacturing Technology Metal Cutting and Machine Tools"
- 2. https://freevideolectures/A0dTvf_Q8BA / Prof.A.B.Chattopadhyay, "Manufacturing Process"

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	-	1	-	-	-	-	-	1	1	1	2
2	3	2	1	-	-	1	-	-	-	-	-	1	1	1	2
3	3	2	1	-	-	1	-	-	-	-	-	1	1	1	2
4	3	2	1	-	-	1	-	-	-	-	-	1	1	1	2
5	3	2	1	-		1	-		-		-	1	1	1	2
6	3	2	1	-	-	1	-	-	-	-	-	1	1	1	2
Avg	3	2	1	-	-	1	-	-	-	-	-	1	1	1	2

Mapping of Cos-Pos & PSOs





SENGUNTHAR ENGINEERING COLLEGE



23MEE302

METROLOGY AND MEASUREMENTS

(Lab Embedded Theory Course)

LTPC 3024

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OBJECTIVES

- To study the concepts of measurement and characteristics of instruments.
- To learn the method of linear and angular measurements techniques.
- To understand the use of laser and advances in metrology for linear geometric dimensions.
- To study the measurement of thread and gear terminologies using suitable instruments.
- To understand the methods of measurement of force, torque, power, flow and temperature.
- To understand the measurement of mechanical parameters using suitable instruments.

UNIT I BASICS OF METROLOGY

Introduction - Need for measurements - Methods of measurement - Generalized measuring systems - Units and Standards - Types of measuring instruments - Errors in Measurement - Types of errors - Calibration and Interchangeability - Precision and Accuracy - Characteristics of measuring instruments. Limits, Fits and Tolerance.

UNIT II LINEAR AND ANGULAR MEASUREMENTS

Linear Measuring Instruments: Vernier Caliper, Vernier Height and Vernier Depth Gauge - Inside, Outside and Depth Micrometer - Slip Gauge - Limit Gauge - Comparator: Mechanical, Pneumatic and Electrical - Angular Measurements: Bevel protractor, Sine bar, Angle Decker, Autocollimator.

UNIT III ADVANCES IN METROLOGY

Interferometer: NPL Flatness, Laser and Michelson - Coordinate Measuring Machine - Basic concept, Types, Constructional features, Probes, Accessories - Basic concepts of Machine Vision System - Element -Applications.

UNIT IV FORM MEASUREMENT

Principles and Methods of straightness - Flatness measurement - Thread measurement, gear measurement, surface finish measurement, Roundness measurement - Applications

UNIT V MEASUREMENT OF MECHANICAL PARAMETERS

Measurement of forces: Direct methods - Equal arm balance and unequal arm balance - Indirect methods -Accelerometers, Load cells, Bourdon tubes. Torque measurement: Strain gauges - Torsion bars. Measurement of Power: Mechanical and DC dynamometers, Eddy current dynamometers. Measurement of flow: Hot wire anemometer, Ultrasonic flow meter.







LIST OF EXPERIMENTS

- 1. Calibration of precision measuring instruments: Vernier caliper, Micrometer, Vernier height gauge and
- 2. Calibration of bore gauge and telescopic gauge.
- 3. Measurement of taper angle using sine bar/sine center and angular dimension measurement using Bevel protractor.
- 4. Measurement of thickness of gear tooth using gear tooth Vernier.
- 5. Comparison of gear/screw parameter using Profile projector/Tool Maker"s microscope.
- 6. Measurement of force
- 7. Measurement of torque
- 8. Measurement of temperature.
- 9. Inspection of specimen using Mechanical/Electrical comparator.
- 10. Measurement of screw thread parameter using Floating Carriage Micrometer.
- 11. Measurement of straightness and flatness using two axes Auto Collimator.

TOTAL: 45+15=60 PERIODS

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

- Describe the concepts of measurements to apply in various metrological instruments.
- Illustrate the methods for linear, angle and flatness measurements and select a suitable method and its relevant instrument for a given application.
- Explain the procedure for conducting computer aided inspection.
- Describe the measurement techniques for threads, gear tooth profiles, surface roughness, and flatness.
- Analyze the suitability of different measuring instruments for various applications by considering factors such as accuracy, range, and environmental conditions.
- Examine various measuring techniques of mechanical properties in industrial applications.

TEXT BOOKS

OUTCOMES

- 1. R.K. Rajput, " A textbook of Measurements and Metrology", Katson Publishers, 2019.
- 2. Venkateshan, S. P., "Mechanical Measurements", John Wiley & Sons, Fourth Edition, 2020.
- 3. Jain R.K. "Engineering Metrology", Khanna Publishers, Twenty first Edition, 2020.

REFERENCES

- 1. Raghavendra , Krishnamurthy "Engineering Metrology & Measurements", Oxford Univ. Press, First Edition, 2020.
- 2. Gupta. I.C., "Engineering Metrology", Dhanpatrai Publications, Fourth Edition, 2021.
- 3. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", Pearson Education, 2019.







E-RESOURCES

- 1. https://nptel.ac.in/courses/112/104/112104250/ (Introduction to Measurements and Metrology)
- http://www.downloadmela.com/video-lectures/engineering5/mechanicalengineering6/ mechanical measurements-and-metrology/ - (Metrology and Measurements)

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	1	-	-	1	3	2	1
2	3	2	2	2	-	-	-	-	1	-	-	1	3	2	1
3	3	2	2	2	-	-	-	-	1	-	-	1	3	2	1
4	3	2	2	2	-	-	-	-	1	-	-	1	3	2	1
5	3	2	2	2	-	-	-	-	1	-	-	1	3	2	1
6	3	2	2	2	-	-	-	-	1	-	-	1	3	2	1
AVG	3	2	2	2	-	-	-	-	1	-	-	1	3	2	1

Mapping of Cos-Pos & PSOs







23CEE402

FLUID MECHANICS AND MACHINERY (Lab Embedded Theory Course)

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OBJECTIVES

- To study the properties of fluid flow characteristics and its dynamics.
- To understand the difference between laminar and turbulent flow through circular conduits and losses in pipe flow.
- To learn the knowledge of dimensional and model analysis.
- To study the types of pumps, working principle, application and performance analysis of fluid pumps.
- To understand the types of turbines, working principle, velocity triangle and performance curves of hydraulic turbines.
- To know the principles studied in fluid mechanics theory by performing experiments in lab.

UNIT I FLOW CHARACTERISTICS AND DYNAMICS OF FLUID FLOW

Introduction - Properties of fluids - Flow characteristics - Rate of flow, concept of control volume and continuity equation for one dimensional flow. Dynamics of fluid flow - Euler's equation of motion, Bernoulli's equation and its application.

UNIT II FLUID FLOW TYPES AND FLOW THROUGH PIPES

Flow of viscous fluid through circular pipe- Hagen Poiseuille equation - Types of fluid flow - Steady and unsteady, Uniform and non-uniform, Laminar and Turbulent, Compressible and incompressible, Rotational and irrotational (Qualitative treatment). Flow through pies (Loss of energy in pipes) - Major losses - Darcy-Weisbach equation and Chezy's formula - Minor losses - Moody diagram (Qualitative treatment) - Flow though pipes in series and in parallel.

UNIT III DIMENSIONAL AND MODEL ANALYSIS

Introduction - Derived quantities - Dimensional Homogeneity - Method of dimensional analysis - Rayleigh's method and Buckingham's π- theorem. Similitude - Types of similitude - Dimensionless numbers - Model laws - Application of dimensionless parameters - Model analysis.

UNIT IV HYDRAULIC PUMPS

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

UNIT V HYDRAULIC TURBINE

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





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LIST OF EXPERIMENTS

- 1. Coefficient of discharge of Venturi meter.
- 2. Coefficient of discharge of Orifice meter.
- 3. Determination of friction factor for a given set of pipes.
- 4. Determination of co-efficient of discharge for an external mouth piece.
- 5. Performance test on centrifugal pump.
- 6. Performance test on reciprocating pump
- 7. Performance test on gear pump.
- 8. Performance analysis of Pelton wheel.
- 9. Performance analysis of Francis turbine.
- 10. Performance analysis of Kaplan turbine.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Analyze the dynamics of fluid flow and summarize the flow characteristics.
- Explain the concepts of flow characteristics, including Reynolds number and its influence on flow regime.
- Describe the concept of model analysis, including how physical models are scaled and tested to simulate real-world fluid flow problems.
- Explain the performance of pumps.
- Explain the operating principles of various turbines and how they convert energy from fluids into mechanical work.
- Apply the Bernoulli's principle to find the coefficient of discharge, determine the friction factor for set of pipes, and analyze the performance characteristics of turbine and pumps.

TEXT BOOKS

- 1. Bansal R.K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, Seventh Edition, 2019.
- 2. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, Sixth Edition, 2019.
- 3. Rajput R.K, "Fluid Mechanics and Hydraulic Machines", S. Chand Publishing Limited, Third Edition, 2021.







REFERENCES

- 1. K.L Kumar, "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., Seventh Edition, 2019.
- 2. Giles, R.V, Evett, J.B & Liu C, "Fluid Mechanics and Hydraulics", Tata McGraw Hill, Second Edition, 2020.
- 3. Khurmi R S, "Fluid mechanics& hydraulic Machines. (in S.I. units)", S Chand & Company Limited, Third Edition, 2019.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/105/112105171/ (Fluid Mechanics)
- 2. https://nptel.ac.in/courses/112/105/112105182/ (Introduction to Fluid Mechanics and Compressible flow)

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со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3
2	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3
3	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3
4	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3
5	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3
6	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3
AVG	3	3	2	2	-	2	2	-	2	-	-	2	3	2	3

Mapping of Cos-Pos & PSOs





23EEC301

PROFESSIONAL DEVELOPMENT

L T P C 0 0 2 1

OBJECTIVES

To be proficient in important Microsoft Office tools: MS WORD, EXCEL and POWERPOINT.

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

MS WORD:

Create and format a document

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

MS EXCEL:

- Create worksheets, insert and format data
- Work with different types of data: text, currency, date, numeric etc.
- Split, validate, consolidate and Convert data
- Sort and filter data



10 Hours



Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.) Work with Lookup and reference formulae Create and Work with different types of charts Use pivot tables to summarize and analyze data Perform data analysis using own formulae and functions Combine data from multiple worksheets using own formulae and built-in functions to generate results Export data and sheets to other file formats Working with macros Protecting data and Securing the workbook **10 Hours MS POWERPOINT:** Select slide templates, layout and themes Formatting slide content and using bullets and numbering Insert and format images, smart art, tables, charts Using Slide master, notes and handout master Working with animation and transitions

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Organize and Group slides

Import or create and use media objects: audio, video, animation

Perform slideshow recording and Record narration and create presentable videos

TOTAL: 30 PERIODS

BSCIC

OUTCOMES

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

- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements.
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding.
- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.





SEMESTER IV

23MET401

KINEMATICS OF MACHINERY

LTPC 3 104

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OBJECTIVES

- To learn the fundamentals of kinematics and to understand the concept of machines, mechanisms and related terminologies.
- To study the displacement, velocity and acceleration analysis of simple mechanisms.
- To learn the displacement, velocity and acceleration diagrams for a given cam profile and analyse the special contour cams.
- To know the basic concepts, terminologies of gears and gear trains.
- To understand the occurrence and its effects of friction in various machine elements.

UNIT I BASICS OF MECHANISMS

Classification of mechanisms - Basic kinematic concepts and definitions - Degree of freedom, Mobility - Kutzbach criterion, Gruebler's criterion – Grashof's Law - Kinematic inversions of four -bar chain and slider crank chains - Limit positions - Mechanical advantage – Transmission Angle - Quick return mechanisms

UNIT II LINKAGE MECHANISMS

Displacement, velocity and acceleration analysis of simple mechanisms - Graphical method - Velocity and acceleration polygons - Velocity analysis using instantaneous centres.

UNIT III CAM MECHANISMS

Classification of cams and followers - Terminology and definitions - Displacement diagrams - Uniform velocity, parabolic, simple harmonic and cycloidal motions - Derivatives of follower motions - Layout of plate cam profiles.

UNIT IV GEARS AND GEAR TRAINS

Law of toothed gearing - Involutes and cycloidal tooth profiles - Spur Gear terminology and definitions – Gear tooth action - Contact ratio - Interference and undercutting. Gear trains - Speed ratio, train value - Epicyclic Gear Trains

UNIT V FRICTION IN MACHINE ELEMENTS

Surface contacts - Sliding and Rolling friction - Friction drives - Friction in screw threads - Friction clutches

TOTAL :45 +15=60 PERIODS







OUTCOMES

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

- Explain the basic principles of kinematics, including how they apply to different types of mechanical systems and machines.
- Analyze the velocity and acceleration on various links which constitute a mechanism.
- Apply the working principle of cams to solve practical problems in mechanical systems where cam mechanisms are used.
- Solve problems on gears and gear trains.
- Examine friction in machine elements.

TEXT BOOKS

- 1. Rattan, S.S, "Theory of Machines", Tata McGraw-Hill, Fifth Edition, 2019.
- 2. R.S.Khurmi and J.K.Gupta, "Theory of Machines" S.Chand and Co Ltd., Fourteenth Edition, 2022.
- 3. Ramamurthi. V, "Mechanics of Machines", Narosa Publishing House, Third Edition, 2021.

REFERENCES

- 1. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, Third Edition, 2019.
- 2. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., Fifth Edition, 2020.
- 3. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, Fourth Edition, 2020.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/104/112104121/ (Kinematics of Machines)
- 2. https://nptel.ac.in/courses/112/105/112105268/ (Kinematics of Mechanism and Machines)

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	-	-	1	-	-	-	1	3	1	2
2	3	2	2	-	2	-	-	1	-	-	-	1	3	1	2
3	3	2	2	-	2	-	-	1	-	-	-	1	3	1	2
4	3	2	2	-	2	-	-	1	-	-	-	1	3	1	2
5	3	2	2	-	2	-	-	1	-	-	-	1	3	1	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	2	-	2	-	-	1	-	-	-	1	3	1	2





ENGINEERING MATERIALS AND METALLURGY

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OBJECTIVES

23MET402

- To understand the constitution of alloys and phase diagrams.
- To learn about different phases and heat treatment methods to tailor the properties of Fe-C alloys.

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- To study the metallurgical properties of Non-ferrous metals, aluminium alloy and bearing materials.
- To understand non-metallic materials, including their types, properties, and applications
- To know proficiency in selecting suitable materials based on their properties and understanding various testing methods to Acquire material performance.

UNIT I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS

Constitution of alloys - Solid solutions, substitutional and interstitial - Phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron-carbon equilibrium diagram - Classification of steel and cast Iron microstructure, properties and application.

UNIT II HEAT TREATMENT

Definition - Full annealing, stress relief, recrystallisation and spheroidising - Normalising, Hardening and Tempering of steel - Isothermal transformation diagrams - cooling curves superimposed on I.T - Diagram CCR - Hardenability, Jominy end quench test - Austempering, martempering - Case hardening, carburizing, Nitriding, cyaniding, carbonitriding - Flame and Induction hardening.

UNIT III FERROUS AND NON-FERROUS METALS

Effect of alloying elements on steel (Mn, Si, Cr, Mo, V, Ti & W stainless and tool steels - HSLA, Maraging steels - Cast Iron - Grey, white, malleable, spheroidal - Alloy cast irons, Copper and copper alloys - Brass, Bronze and Cupronickel - Aluminium and Al-Cu - Precipitation strengthening treatment - Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

UNIT IV NON-METALLIC MATERIAL

Polymers - Types of polymer, commodity and engineering polymers - Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, Polymers - Urea and Phenol formaldehydes) - Engineering Ceramics - Properties and applications of Al₂O₃, SiC, Si₃N₄, PSZ and Sialon.

UNIT V MECHANICAL PROPERTIES AND TESTING

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







OUTCOMES

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

- Analyze the structures of materials and interpret the phase diagrams.
- Describe the concept of heat treatment of steels and hardening mechanisms.
- Explain the fundamental principles behind tailoring material properties of ferrous and non-ferrous metals.
- Summarize the properties and applications of non metallic materials. •
- Apply suitable testing methods to analyze mechanical properties of materials.

TEXT BOOKS

- 1. O.P. Khanna, A text book of Materials Science and Metallurgy, Khanna Publishers, Eighth Edition, 2020.
- 2. Kenneth G.Budinski and Michael K.Budinski "Engineering Materials properties and selection" Pearson India Education Services Pvt ltd, Nineth edition, 2019.
- 3. William D.Callister, Jr and David G.Rethwisch "Materials science and Engineering, An introduction" Wiley, Tenth Edition, 2020.

REFERENCES

- 1. Jindal U.C, "Material Science and Metallurgy", Dorling Kindersley Publication, Third Edition, 2019.
- 2. Raghavan V, "Materials Science and Engineering: A First Course", Prentice Hall of India Pvt. Ltd., Seventh Edition, 2019.
- 3. T.DebRoy, H.K.D.H. Bhadeshia "Innovations in Everyday Engineering Materials" Springer International Publishing, First Edition, 2021.

E-RESOURCES

- 1. https://nptel.ac.in/courses/113/102/113102080/ (Introduction to Material science and Engineering)
- 2. https://nptel.ac.in/courses/113/104/113104068/ (Phase diagram in Material science and Engineering)

pping	of Co	os-Pos	s & PS	SOs											
СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	2	-	2	2	-	-	2	-	-	2	3	1
2	2	2	-	2	-	2	2	-	-	2	-	-	2	3	1
3	2	2	-	2	-	2	2	-	-	2	-	-	2	3	1
4	2	2	-	2	-	2	2	-	-	2	-	-	2	3	1
5	2	2	-	2	-	2	2	-	-	2	-	-	2	3	1
6	-	-	-	-	-			-	-		-	-	-	-	-
AVG	2	2	-	2	-	2	2	-	-	2	-	-	2	3	1
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23MEE401

THERMAL ENGINEERING

(Lab Embedded Theory Course)

(Use of Standard Refrigerant Tables and Chart Data Book and Steam Table is Permitted)

OBJECTIVES

- To understand the working of various auxiliary systems of internal combustion engines.
- To learn the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes.
- To know the thermodynamic concepts into various thermal application like steam nozzles and turbines.
- To understand the principles and working of air compressors.
- To know the various refrigeration and air conditioning systems,
- To understand the value timing, port timing diagram of IC engine, performance test on diesel engine, compressor and characteristics of fuels/lubricates.

UNIT I INTERNAL COMBUSTION ENGINES

IC engines - Classification, Components and their function - Valve timing diagram and port timing diagram - Actual and theoretical p-V diagram of four stroke and two stroke engines and their comparison - Fuel injection system and Ignition system - Battery and Magneto Ignition System - Knocking in SI and CI Engines - Supercharger and Turbocharger - Lubrication and Cooling systems - Performance calculation.

UNIT II GAS POWER CYCLES

Air standard efficiency - Mean effective pressure - Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure and air standard efficiency - Comparison of cycles.

UNIT III STEAM NOZZLES AND TURBINES

Steam nozzle - Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow - Impulse and Reaction principles, compounding, velocity diagram for simple turbines, speed regulations - Governors.

UNIT IV AIR COMPRESSOR

Classification of air compressors and working principle of various types of compressors - Construction and working of single stage air compressor with and without clearance - Volumetric efficiency - Isothermal efficiency and Isentropic efficiency of reciprocating compressors - Multistage air compressor and inter cooling - Work of multistage air compressor.

UNIT V REFRIGERATION AND AIR CONDITIONING

Refrigerants - Vapour compression refrigeration cycle - Performance calculations - Super heat, sub cooling -Working principle of vapour absorption system, Ammonia - Water, Lithium bromide - Water systems (Description only) - Air conditioning system - Processes - Types and Working Principles - Simple Cooling Load calculations.



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LIST OF EXPERIMENTS

- 1. Valve Timing diagrams.
- 2. Port Timing diagrams.
- 3. Performance Test on 4 stroke Diesel Engine.
- 4. Heat Balance Test on 4 stroke Diesel Engine
- 5. Morse Test on Multi-cylinder Petrol Engine.
- 6. Retardation Test on a Diesel Engine.
- 7. Determination of Flash Point and Fire Point of various fuels / lubricants.
- 8. Performance Test on Reciprocating air compressor.
- 9. Determination of COP of refrigeration systems.
- 10. Experiments on psychrometric processes

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Describe the role and function of each component within the internal combustion engine.
- Analyze the different properties of gas power cycles and apply in different Thermal engineering applications.
- Explain the formation of steam, steam nozzles and turbines.
- Apply knowledge of flow parameters to assess the performance of air compressors in specific applications.
- Describe the concepts of Refrigeration cycles and Air Conditioning systems.
- Conduct performance tests on petrol engines, diesel engines, and compressors, and apply standard methods for evaluation.

TEXT BOOKS

- 1. Kothandaraman.C.P, Domkundwar.S, Domkundwar.A.V., "A course in thermal Engineering" "Dhanpat Rai & sons, Sixth Edition, 2020.
- 2. Rajput. R. K., "Thermal Engineering" S.Chand Publishers, Eigth Edition, 2019.
- 3. Michael A. Boles, Yunus A. Cengel, "Thermodynamics: An Engineering Approach", Tata McGraw Hill Education, Eighth Edition, 2021.

REFERENCES

- 1. Arora.C.P, "Refrigeration and Air Conditioning ", Tata McGraw-Hill Publishers, Fifth Edition, 2021.
- 2. Ganesan.V " Internal Combustion Engines", Tata Mcgraw-Hill, Third Edition, 2019.
- 3. Manohar Prasad, "Refrigeration and Air Conditioning", New Age International publications, Third Edition, 2021.







E-RESOURCES

- 1. https://nptel.ac.in/courses/112/103/112103262/ (Engine and Gas Turbines)
- 2. https://nptel.ac.in/courses/112/103/112103275/ (Applied Thermodynamics for Engineers)

Mapping of Cos-Pos & PSOs

со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	2	1	1	1	-	1	-	1	3	3	1	2
2	3	3	2	2	1	1	1	-	1	-	1	3	3	1	2
3	3	3	2	2	1	1	1	-	1	-	1	3	3	1	2
4	3	3	2	2	1	1	1	-	1	-	1	3	3	1	2
5	3	3	2	2	1	1	1	-	1	-	1	3	3	1	2
6	3	3	2	2	1	1	1	-	1	-	1	3	3	1	2
AVG	3	3	2	2	1	1	1	-	1	-	1	3	3	1	2





IAS-ANZ BSCICE

23MEE402

STRENGTH OF MATERIALS

(Lab Embedded Theory Course) (Common to Mechanical and Robotics and Automation)

OBJECTIVES

- To understand the concepts of stress and strains.
- To study the concept of two dimensional stress systems and stresses in thin and thick cylinders.
- To know about shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To understand the different techniques for determining the slope and deflection of beams under various loading conditions.
- To understand and analyze the stresses induced in shafts and helical springs due to torsional loads, using fundamental principles of torsion theory.
- To learn the mechanical properties of materials when subjected to different types of loading.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

Stresses types -Tension, Compression and Shear Stresses - Hooke's law - Stresses and strains due to axial force in stepped and composite bars - Stresses due to thermal effect in composite bars - Factor of safety - Poisson ratio - Elastic constants and their relationship.

UNIT II STRESSES IN TWO DIMENSIONS

Stresses on inclined planes - Principal planes and Principal stresses - Mohr's circle for bi-axial stress with shear stress - Analytical and Graphical methods. Hoop and longitudinal stresses in thin and thick cylindrical vessels, Maximum Shear stress, Changes in dimensions and volume.

UNIT III TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAMS

Types of supports, Loads and beams - Shear force and bending Moment in cantilever, simply supported and overhanging beams. Theory of simple bending - Bending stress distribution – Load carrying capacity - Proportioning of sections - Shear stress distribution.

UNIT IV DEFLECTION OF BEAMS AND COLUMNS

Evaluation of slope and deflection of cantilever and simply supported beams – Double integration method -Macaulay's method. Types of Columns, Equivalent length, Euler and Rankine formulae, Slenderness ratio.

UNIT V TORSION IN SHAFT AND HELICAL SPRING

Torsion of circular solid and hollow shafts - Shear strength - Angle of twist and torsional stiffness - Stresses in helical springs - Deflection of helical springs, carriage springs.



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LIST OF EXPERIMENTS

- 1. Tension test on steel rod in U.T.M.
- 2. Torsion test on steel rod.
- 3. Impact test on metal specimen.
- 4. Hardness test on metals Brinell and Rockwell Hardness.
- 5. Deflection test on beams.
- 6. Spring Test Open coil and Closed coil.
- 7. Effect of Hardening improvement of hardness and impact resistance of steels
- 8. Tempering- Improvement Mechanical properties Comparison
 - (i) Unhardened specimen
 - (ii) Quenched Specimen and
 - (iii) Quenched and tempered specimen.
- 9. Double shear test on metal
- 10. Microscopic Examination of
 - (i) Hardened samples and
 - (ii) Hardened and tempered samples.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Examine how variations in material properties and structure configurations affect the overall stress and strain responses.
- Analyze the importance of two dimensional stress systems and stresses in thin and thick cylinders.
- Draw the shear force and bending moment diagrams for beams subjected to various loading conditions, such as point loads, distributed loads, and moments.
- Apply the impact of estimated slopes and deflections on the overall design and safety of structural components.
- Apply torsion equation in design of circular shafts and helical springs.
- Examine how the results from different tests compare and what they reveal about the specimen's overall mechanical behavior.

TEXT BOOKS

- 1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., New Delhi, Sixth Edition, 2021
- 2. Rajput R K., "A Textbook of Strength of Materials (Mechanics of Solids)", S Chand and Company Ltd., Fourth Edition, 2020.
- 3. F.P. Beer and R.Johnston, "Mechanics of Materials", McGraw Hill Education India (P) Ltd., Seventh Edition, 2023.







REFERENCES

- 1. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, Second Edition, 2021.
- 2. Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, Fourth Edition, 2023.
- 3. Rattan.S.S, "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., Fourth Edition, 2023.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/107/112107146 (Strength of Materials)
- 2. https://nptel.ac.in/courses/105/105/105105108/ (Introduction to Strength of Materials)

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	3	-	3	2	3	-	3	3	2	3
2	3	3	3	-	-	3	-	3	2	3	-	3	3	2	3
3	3	3	3	-	-	3	-	3	2	3	-	3	3	2	3
4	3	3	3	-	-	3	-	3	2	3	-	3	3	2	3
5	3	3	3	-	-	3	-	3	2	3	-	3	3	2	3
6	3	3	3	-	-	3	-	3	2	3	-	3	3	2	3
AVG.	3	3	3	-	-	3	-	3	2	3	-	3	3	2	3

Mapping of Cos-Pos & PSOs





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23GEE301

PROBLEM SOLVING AND PYTHON PROGRAMMING

(Lab Embedded Theory Course)

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OBJECTIVES

- To understand the basics of algorithmic problem solving.
- To learn the data types, expressions and the statements in python.
- To study the Python functions and function calls to solve problems.
- To learn python data structures-list, tuples, dictionaries to represent complex data.
- To understand the file modules and python packages.
- To practice various computational operations and develop solutions using python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING

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

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS

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

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS

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

UNIT IV LISTS, TUPLES, DICTIONARIES

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

UNIT V FILES, MODULES, PACKAGES& DATA VISUALIZATION

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file - Importing Matplotlib – Introduction to plotting – visualizing errors – density and contour plots – Histograms.







LIST OF EXPERIMENTS

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

TOTAL : 45 +15 = 60 PERIODS

OUTCOMES

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

- Develop algorithmic solutions to solve simple computational problems.
- Develop python programs using expressions to solve the problem.
- Deploy functions and function calls to decompose python programs.
- Implement solutions using compound data in Python lists, tuples, dictionaries.
- Utilize file modules and python packages for developing applications
- Implement python programs for solving various computational problems







TEXTBOOKS

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

REFERENCES

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, First Edition, 2021.

2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data

Scientists", Notion Press, First Edition, 2021.

E – RESOURCES

- 1. https://nptel.ac.in/courses/106104074(Introduction to Algorithms)
- 2. https://archive.nptel.ac.in/courses/106/106/106106182/ (Joy of Computing)

Mapping of Cos-Pos& PSOs

со	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
AVG	2.33	2.5	1.5	1.83	1.83	-	-	-	-	-	1.5	0.66	2.66	0.5	-



SEC - UG - R2023 / JUNE - 2024 (REVISED)

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Semester - V

DESIGN OF MACHINE ELEMENTS

(Use of Approved Design Data Book is Permitted)

OBJECTIVES

23MET501

- To learn the various steps involved in the Design Process. •
- To understand the various types of forces and loading conditions that act on machine elements.
- To study the stresses acting on the temporary and permanent joints. •
- To understand the various types of springs under constant loads and varying loads.
- To understand the various types of bearing like rolling contact and sliding contact bearing.

UNIT I FUNDAMENTAL CONCEPTS IN DESIGN

Introduction to the design Process - Direct, Bending and Torsional Stress Equations - Eccentric Loading -Calculation of principle stresses for various Load Combinations - Theories of failure - Design of curved Beams - Crane hook and C frame - Stress Concentration - Design for variable loading - Soderberg, Goodman and Gerber Relations.

DESIGN OF SHAFTS AND COUPLINGS UNIT II

Design of solid and hollow shafts based on strength, rigidity and critical speed - Keys, keyways and splines - Rigid and flexible couplings.

UNIT III **DESIGN OF TEMPORARY AND PERMANENT JOINTS**

Threaded fasteners - Design of bolted joints under eccentric loading - Design of welded joints - Design of riveted joints for structures.

UNIT IV DESIGN OF SPRINGS

Springs - Types- Helical springs, materials, end connections, terms used in compression springs - Stresses and deflection in helical springs of circular wire - Surge in springs - Design of leaf springs - Stress and deflection equation - Advantage and Applications.

DESIGN OF BEARINGS UNIT V

Sliding Contact bearing - Design of journal Bearings - Rolling contact bearings - Selection of rolling contact bearings.

OUTCOMES

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

- Analyze the various stresses in machine elements.
- Apply design principles to determine appropriate shaft dimensions and coupling types for specific power transmission requirements.
- Describe the design considerations for joints under different loading conditions. •
- Apply design principles to develop energy-storing elements suitable for specific loading conditions.
- Select appropriate bearings for specific mechanical applications based on load requirements and • operational conditions.







LTPC

3104

9+3

9+3

9+3

9+3

TOTAL: 45 +15 PERIODS

9+3





TEXT BOOKS

- 1. Shigley J.E and Mischke C. R., "Mechanical Engineering Design", McGraw-Hill, Eleventh Edition, 2020.
- 2. R.S.Khurmi and J.K.Gupta, "A Text Book of Machine Design", S.Chand Publications, 2020.
- 3. Bhandari V B, "Design of Machine Elements", Tata McGraw-Hill Book Co, Fifth Edition, 2020

REFERENCES

- 1. Sundararajamoorthy T. V, Shanmugam .N, Machine Design, Anuradha Publications, Second Edition, 2019.
- 2. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine component Design", Wiley, Seventh Edition, 2021.
- 3. M. F. Spotts, Terry E. Shoup, Design of Machine Elements, Eighth Edition, 2019

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/105/112105124/ (Design of Machine Elements I)
- 2. https://archive.nptel.ac.in/courses/112/106/112106137/ (Machine Design II)

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	2	-	-	-	2	1	-	-	2	3	2	2
2	3	2	3	2	-	-	-	2	1	-	-	2	3	2	2
3	3	2	3	2	-	-	-	2	1	-	-	2	3	2	2
4	3	2	3	2	-	-	-	2	1	-	-	2	3	2	2
5	3	2	3	2	-	-	-	2	1	-	-	2	3	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	3	2	-	-	-	2	1	-	-	2	3	2	2

Mapping of Cos-Pos & PSOs

SEC - UG - R2023 / JUNE - 2024 (REVISED)

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23MEE501

OBJECTIVE

(Lab Embedded Theory Course)

DYNAMICS OF MACHINERY

To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.

- To know the undesirable effects of unbalances resulting from prescribed motions in mechanism.
- To learn the effect of dynamics of free vibrations.
- To study the effect of dynamics of forced vibrations. •
- To understand the principles in mechanisms used for speed control and stability control. .
- To study how certain measuring devices are used for dynamic testing

UNIT I FORCE ANALYSIS

Dynamic force analysis - Inertia force and Inertia torque - D Alemberts principle - Dynamic analysis in reciprocating engines - Inertia effect of connecting rod - Crank shaft torgue - Turning moment diagrams.

Unit II BALANCING

Static and dynamic balancing - Balancing of rotating masses - Balancing a single cylinder engine -Balancing of multi-cylinder inline - Partial balancing in engines - Balancing machines.

Unit III **FREE VIBRATION**

Basic features of vibratory systems - Free vibration - Equations of motion - Natural frequency - Types of damping - Damped vibration - Critical speeds of shafts - Torsional vibration - Two and three rotor torsional systems.

FORCED VIBRATION Unit IV

Response of one degree freedom systems to periodic forcing - Harmonic disturbances - Disturbance caused by unbalance - Support motion - Transmissibility - Vibration isolation

Unit V MECHANISM FOR CONTROL

Governors and its types - Gyroscopes - Gyroscopic forces and torques - Gyroscopic effects in ships and airplanes.

LIST OF EXPERIMENTS

- 1. Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
- 2. a) Balancing of rotating masses. b) Balancing of reciprocating masses.
- Whirling of shafts Determination of critical speeds of shafts with concentrated loads.
- Determination of transmissibility ratio using vibrating table.
- 5. Motorized gyroscope Study of gyroscopic effect and couple.
- 6. Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
- 7. Vibration of Equivalent spring mass system.

TOTAL: 45+15=60 PERIODS

JAS-ANZ BSCIC ISO 9001 REGISTERED

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Page 97



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OUTCOMES

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

- Analyze force distribution in mechanisms to understand how static and dynamic forces interact.
- Analyze the balancing masses and their locations of reciprocating and rotating masses.
- Explain the concept of natural frequency and its role in free vibration.
- Explain the frequency of forced vibration and damping coefficient.
- Analyze the speed and lift of the governor and estimate the gyroscopic effect on ships and airplanes.
- Explain the significance of mass moment of inertia, governor effort, range sensitivity, natural frequency, damping coefficient, critical speeds, and balancing mass in mechanical systems.

TEXT BOOKS

- 1. Rattan, S.S, "Theory of Machines", Tata McGraw-Hill, First Edition, 2020.
- 2. Khurmi, R.S., "Theory of Machines", S Chand Publications, Tenth Edition, 2022.
- 3. Sadhu Singh, "Theory of Machines," Pearson Education Pvt. Ltd., Indian Branch, Third Edition 2020.

REFERENCES

- 1. Uicker, J.J., Pennock.G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, Fifth Edition, 2021.
- 2. R L Norton, "Kinematics and Dynamics of Machinery", McGraw-Hill Education, Fifth Edition, 2021
- 3. A.S.Ravindra, "Theory of Machines I", by, Sudha Publications, Third Edition, 2021

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/104/112104114/ (Dynamics of Machines)
- www.downloadmela.com/video-lectures/engineering5/mechanical-engineering6/dynamics-ofmachines/- Dynamics of Machines)

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3		2		1						2	3		3
2	3	3		2		1						2	3		3
3	3	3		2		1						2	3		3
4	3	3		2		1						2	3		3
5	3	3		2		1						2	3		3
6	3	3		2		1			2	2		2	3	2	3
AVG	3	3		2		1			2	2		2	3	2	3

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23MEE502

ESTD 2001

HEAT AND MASS TRANSFER

LT PC 3024

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OBJECTIVES

- To understand the mode of heat transfer through various configuration.
- To understand the convection in various systems. •
- To learn the thermal analysis and sizing of heat exchangers. •
- To know about the radiation in heat transfer. •
- To understand the basic concepts of mass transfer.
- To Study the heat transfer phenomena predict the relevant coefficient using implementation.

UNIT I CONDUCTION

General Differential equation of Heat Conduction- Cartesian and Polar Coordinates - One Dimensional Steady State Heat Conduction - plane and Composite Systems - Conduction with Internal Heat Generation - Extended Surfaces - Unsteady Heat Conduction - Lumped Analysis - Semi Infinite and Infinite Solids

UNIT II CONVECTION

Free and Forced Convection - Hydrodynamic and Thermal Boundary Layer. Free and Forced Convection during external flow over Plates and Cylinders and Internal flow through tubes.

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS

Nusselt's theory of condensation - Regimes of Pool boiling and Flow boiling - Correlations in boiling and condensation - Heat Exchanger Types - Overall Heat Transfer Coefficient – Fouling Factors - Analysis – LMTD method - NTU method.

UNIT IV RADIATION

Black Body Radiation – Grey body radiation - Absorptivity, Reflectivity and Transmissivity – Kirchoff's Law of Radiation -Shape Factor – Electrical Analogy – Radiation Shields. Radiation through gases.

UNIT V MASS TRANSFER

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations.

LIST OF THE EXPERIMENTS

- 1. Thermal conductivity measurement of pipe insulation using lagged pipe apparatus
- 2. Determination of heat transfer coefficient under natural convection from a vertical cylinder
- 3. Determination of heat transfer coefficient by forced convection inside tube
- 4. Efficiency calculation of a pin-fin apparatus (natural and forced convection modes)
- 5. Determination of emissivity of a given grey surface
- 6. Determination of Stefan - Boltzmann constant
- 7. Thermal conductivity measurement using guarded plate apparatus.

TOTAL: 45 + 15 PERIODS



SENGUNTHAR ENGINEERING COLLEGE



OUTCOMES

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

- Solve heat conduction equations to different surface configurations under steady state heat conduction.
- Analyze free and forced convective heat transfer correlations to internal and external flow.
- Classify the various types of condensation processes in the heat exchangers.
- Compare the thermal radiation exchange between black and gray surfaces to understand the differences in heat transfer.
- Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications.
- Conduct tests on heat conduction, convective heat transfer and radioactive heat transfer apparatus and evaluate thermal conductivity, heat transfer coefficient and emissivity of materials.

TEXT BOOKS

- 1. Holman.J.P, "Heat Transfer", McGraw Hill Education (India) Pvt Ltd, Eleventh Edition, 2020.
- 2. Yunus A. Cengel, Afshin J.Ghajar, "Heat and Mass Transfer: Fundamentals and Applications", McGraw Hill Education, Sixth Edition, 2020.
- 3. John H. Lienhard, "A Heat Transfer", Fifth Edition, Phlogiston Press, 2022

REFERENCES

- 1. Kothandaraman.C.P, "Fundamentals of Heat and Mass transfer", New age international publishers, Fifth Edition, 2022
- 2. Nag, P.K., "Heat Transfer", Fifth Edition, Tata McGraw Hill, 2021.
- 3. Anthony F Mills, "" Basic Heat and Mass Transfer", Pearson College, Second Edition, 2020

E-RESOURCES

- 1. http://nptel.ac.in/courses/112101097/
- 2. https://nptel.ac.in/courses/112/108/112108149/

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2					1			1	3	2	1
2	3	3	3	2					1			1	3	2	1
3	3	3	3	2					1			1	3	2	1
4	3	3	3	2					1			1	3	2	1
5	3	3	3	2					1			1	3	2	1
6	3	3	3	2					1			1	3	2	1

SEC - UG - R2023 / JUNE - 2024 (REVISED)

PROFESSIONAL ELECTIVE - I

WELDING TECHNOLOGY

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ТРС 3 0 03

23MEP501

OBJECTIVES

To understand the basics of welding.

- To learn the resistance welding processes.
- To know the solid state welding processes.
- To understand various welding process.
- To learn various weld joint designs and welding defects.

GAS AND ARC WELDING PROCESSES UNIT I

Fundamental principles - Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electro slag welding processes - advantages, limitations and applications.

UNIT II **RESISTANCE WELDING PROCESSES**

Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III SOLID STATE WELDING PROCESSES

Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and hot pressure welding processes - advantages, limitations and applications.

UNIT IV OTHER WELDING PROCESSES

Thermit welding, Atomic hydrogen welding, CNC Welding, Friction stir welding, Under Water welding, Welding automation in aerospace, nuclear and surface transport vehicles.

UNIT V DESIGN OF WELD JOINTS, WELDABILITY AND TESTING

Various weld joint designs – Welding defects – causes and remedies - Weld ability of Aluminum, Copper, and Stainless steels.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the principles and steps involved in gas and arc welding processes...
- Describe the different types of resistance welding processes and their specific applications.
- Apply knowledge of solid-state welding processes to select appropriate methods for welding
- Compare and contrast special welding processes with conventional welding methods based on . their features and applications.
- Apply knowledge of weld joint design to create effective weld joint configurations.





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

BSCIC

TEXT BOOKS

- 1. Little R.L., "welding Technology", Tata McGraw Hill Publishing Co., Ltd., Fifth Edition, 2019.
- 2. Parmer R.S., "Welding Engineering and Technology", Khanna Publishers, Third Edition, 2020
- 3. O.P,.Khana, "Welding Technology", Thirteenth Edition, Dhanpat Rai Publication, Thirteenth Edition, 2020

REFERENCES

- 1. Davis A.C., "The Science and Practice of Welding", Cambridge University Press, Cambridge, Fourth Edition, 2020.
- 2. Nadkarni S.V. "Modern Arc Welding Technology", Oxford IBH Publishers, Second Edition, 2020
- 3. Gower.A.Kennedy, "Welding Technology", Mac Millam Publisher, Fourth Edition, 2019

E-RESOURCES

- 1. http://www.weld.com (TIG & MIG welding)
- 2. https://go.ipgphotonics.com/laser-welder (Atomic hydrogen welding).

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
2	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
3	2	1	2	-		1	-	-	-	-	-	2	-	-	2
4	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
5	2	1	2	-		1	-	-	-	-	-	2	-	-	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Avg	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2





23MEP502 NON-DESTRUCTIVE TESTING AND EVALUATION OF MATERIALS L T P C

3003

OBJECTIVES

- To study and understand the various Non-Destructive Testing and Evaluation methods.
- To know the various applications of penetrate testing methods.
- To learn the concept of thermography and eddy current testing process.
- To acquire knowledge on ultrasonic testing.
- To learn a basic understanding of radiographic inspection.

UNIT I INTRODUCTION TO NDT AND VISUAL INSPECTION

NDT versus Mechanical testing- Non Destructive Testing Methods - Detection of manufacturing defects -Material characterization - Relative merits and limitations - Various physical characteristics of materials applications in NDT- Visual inspection - Unaided and aided.

UNIT II PENETRANT TESTING

Liquid Penetrant Testing - Principles, types and properties of liquid penetrates - Developers - Advantages and limitations of various methods - Testing Procedure - Interpretation of results - Magnetic Particle Testing -Theory of magnetism, inspection materials, Magnetization methods.

UNIT III EDDY CURRENT TESTING

Eddy Current Testing - Generation of eddy currents - Properties of Eddy currents - Eddy current sensing elements, Probes, Instrumentation - Types of arrangement - Applications, advantages, limitations.

UNIT IV ULTRASONIC TESTING

Ultrasonic Testing - Principle - Transducers - Transmission and pulse-echo method - Straight beam and angle beam - Instrumentation, data representation - A-Scan, B-scan, C-scan - Phased Array Ultrasound - Time of flight diffraction.

UNIT V RADIOGRAPHY (RT)

Principle, interaction of X-Ray with matter, imaging, film and film less techniques - Types and use of filters and screens - Geometric factors - Inverse square law - Characteristics of films - Graininess, density, speed, contrast - Characteristic curves - Penetrameters - Exposure charts, Radiographic equivalence -Fluoroscopy- Xero-Radiography - Computed Radiography - Computed Tomography.

TOTAL: 45 PERIODS

OUTCOMES

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

- Differentiate various types of defects and their characteristics.
- Explain the theoretical principles behind penetrants and penetrant testing.
- Examine the principles and effectiveness of ultrasonic testing methods.
- Apply the concept of ultrasonic testing and acoustic emission.
- Apply principles of radiation to inspect and analyze materials.

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TEXT BOOKS

- 1. Osama Lari, Rajeev Kumar, "Basics of Non -Destructive testing", S.K.Kataria and Sons, First Edition, 2020.
- 2. Don E Bray and Roderick K Stanley, "Non-Destructive Evaluation: A Tool in Design, Manufacturing and Service", CRC Press, Second Edition, 2021.
- 3. Ekantha moorthy J, Perumal S, Mohanraj M, "Non Destructive Testing and Evaluation" Second Edition, 2023

REFERENCES

- 1. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Eleventh Edition, 2020.
- 2. Prasad.J and Nair.C.G.K, "Non-Destructive Test and Evaluation of Materials", Tata McGraw-Hill Publishing company Limited, Second Edition, 2022.
- 3. Giovanni Bruno, "Micro Non-destructive Testing and Evaluation" MDPI Publisher, First Edition, 2023

E-RESOURCES

- https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-mm04/ (Theory and Practice of Non Destructive Testing)
- 2. https://nptel.ac.in/courses/113/106/113106070/ -(Introduction to Non Destructive Testing)

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
2	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
3	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
4	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
5	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2
Avg	2	1	2	-	-	1	-	-	-	-	-	2	-	-	2

Mapping of Cos-Pos & PSOs


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23MEP503

COMPOSITE MATERIALS

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OBJECTIVES

- To know the different manufacturing methods available for composite material.
- To learn a different types of reinforcement.
- To study different processing methods of composite materials.
- To understand properties of composite materials.
- To acquire a knowledge of applications and selection of different composites in consideration of the properties and characteristics.

UNIT I INTRODUCTION TO COMPOSITES

Fundamentals of composites - Need for composites - Enhancement of properties - Classification of composites - Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) - Reinforcement - Particle reinforced composites, Fibre reinforced composites. - Applications of various types of composites.

UNIT II POLYMER MATRIX COMPOSITES

Polymer matrix resins - Thermosetting resins, thermoplastic resins - Reinforcement fibres - Rovings – Woven fabrics - Non woven random mats - various types of fibres - PMC processes -Hand layup processes – Spray up processes - Compression moulding - Reinforced reaction injection moulding - Resin transfer moulding - Pultrusion - Filament winding - Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

UNIT III METAL MATRIX COMPOSITES

Characteristics of MMC - Various types of Metal matrix composites - Alloy vs. MMC - Advantages of MMC - Limitations of MMC - Metal Matrix, Reinforcements - Particles - Fibres - Effect of reinforcement – Volume fraction - Rule of mixtures - Processing of MMC - Powder metallurgy process - Diffusion bonding - Stir casting - Squeeze casting.

UNIT IV CERAMIC MATRIX COMPOSITES

Engineering ceramic materials - Properties - Advantages - Limitations - Monolithic ceramics - Need for CMC - Ceramic matrix - Various types of Ceramic Matrix composites- Oxide ceramics - Non oxide ceramics - Aluminium oxide - Silicon nitride - Reinforcements - Particles- Fibres- Whiskers - Sintering - Hot pressing - Cold isostatic pressing (CIPing) - Hot Isostatic Pressing (HIPing).

UNIT V ADVANCES IN COMPOSITE MATERIALS

Carbon /carbon composites - Advantages of carbon matrix - limitations of carbon matrix Carbon fibre - chemical vapour deposition of carbon on carbon fibre perform. Solgel technique. Composites in aerospace applications.

TOTAL: 45 PERIODS





OUTCOMES

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

- Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project.
- Describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
- Apply the knowledge in metal matrix composites and its processing methods.
- Apply knowledge of ceramic matrix composites to analyze their use in specific applications
- Describe the properties and applications of different composite materials in industrial settings.

TEXT BOOKS

- 1. Chawla, K.K, "Composite Materials", Fourth Edition, Springer Science in progress, Fourth Edition, 2022.
- 2. Balasubramaniam, "Composite Materials", John Wiley & Sons, Indian Ed., Second Edition, 2022.
- 3. A.K.Shrivastava, 'Fundamentals of Composite Materials". Sankal p publications, Second Edition, 2023.

REFERENCES

- 1. Sharma S.C., "Composite materials", Narosa Publications, Third Edition, 2023.
- Issac M. Daniel and Ori Ishai, "Engineering Mechanics of Composite Materials", Oxford University Press - 2006, Third Edition, 2021.
- 3. Vikram M. Ghule , Kunal S. Marathe & Amit A. Shinde, "Composite Materials" Pragati Books, First Edition 2023.

E-RESOURCES

- 1. http://nptel.ac.in/courses/101104010/ (Composite Materials and Structures)
- 2. https://www.digimat.in/nptel/courses/video/112104229/L01.html (Introduction to composites)

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	-	-	1	2	-	-	-	1	1	-	2	1
2	3	3	1	-	-	1	2	-	-	-	1	1	-	2	1
3	3	3	1	-		1	2	-	-	-	1	1	-	2	1
4	3	3	1	-	-	1	2	-	-	-	1	1	-	2	1
5	3	3	1	-		1	2	-	I	-	1	1	-	2	1
Avg	3	3	1	-	-	1	2	-	-	-	1	1	-	2	1

1 - Low 2 - Medium 3 - High '-' - No Correlation



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23MEP504

GREEN MANUFACTURING

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OBJECTIVES

- To understand the concept of environmental design and industrial ecology.
- To acquire a knowledge about air pollution and its effects on the environment.
- To learn about noise and its effects on the environment.
- To understand water pollution and its effects on the environment.
- To know the concept of green co-rating and its need

UNIT I DESIGN FOR ENVIRONMENT AND LIFE CYCLE ASSESSMENT

Environmental effects of design -selection of natural friendly material - Eco design - Environmental damage Material flow and cycles – Material recycling – Emission less manufacturing- Industrial Ecology – Pollution prevention – Reduction of toxic emission – design for recycle.

UNIT II AIR POLLUTION SAMPLING AND MEASUREMENT

Primary and Secondary Pollutants, Automobile Pollutants, Industrial Pollution, Ambient air quality Standards, Metrological aspects of air Pollution, Temperature lapse Rates and Stability-wind velocity and turbulence-Pump behavior dispersion of air Pollutants-solution to the atmosphere dispersion equation the Gaussian Plume Model, Air pollution sampling-collection of gaseous air pollutants-collection of particulate pollutants-stock sampling, analysis of air pollutants-sulfur dioxide-nitrogen dioxide, carbon monoxide, oxidants and ozone.

UNIT III NOISE POLLUTION AND CONTROL

Frequency and Sound Levels, Units of Noise based power radio, contours of Loudness. Effect of human, Environment and properties, Natural and Androgenic Noise Sources, Measuring Instruments for frequency and Noise levels, Masking of sound, Types, Kinetics, Selection of different reactors used for waste treatment, Treatment of noise at source, Path and Reception, Sources of noise, Effects of noise occupational Health hazards, thermal Comforts, Heat Island Effects, Radiation Effects.

UNIT IV WATER DEMAND AND WATER QUALITY

Factors affecting consumption, Variation, Contaminants in water, Nitrates, Fluorides, Detergents, taste and odour, Radio activity in water, Criteria, for different impurities in water for portable and non-portable use, Point and non-point Source of pollution, Major pollutants of Water, Water Quality Requirement for different uses, Global water crisis issues.

UNIT V GREEN CO-RATING

Ecological Footprint - Need for Green Co-Rating – Green Co-Rating System – Intent – System Approach – Weightage- Assessment Process – Types of Rating – Green Co-Benefits – Case Studies of Green Co-Rating

TOTAL: 45 PERIODS



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OUTCOMES

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

- Apply environmental design principles to select appropriate eco-friendly materials for specific projects.
- Describe methods used to reduce or prevent air pollution in manufacturing.
- Analyze the relationship between various manufacturing processes and their noise pollution levels.
- Examine the effectiveness of water treatment and pollution prevention strategies.
- Examine green co-rating and its benefits.

TEXT BOOKS

- 1. E. J. B. T. O'Rourke, K. S. S. Chiu, "Introduction to Green Manufacturing" Springer, Second Edition, 2021
- 2. Rao M.N. and Dutta A.K. "Waste water treatment", Oxford & IBH publishing Co. Pvt. Ltd., Third Edition, 2019.
- 3. A. K. Gupta, B. H. Amaya, "Green Manufacturing and Sustainability of Products", Springer, Second Edition, 2024

REFERENCES

- 1. David A. Dornfeld, "Green Manufacturing fundamentals and applications", Springer, Second Edition, 2021
- 2. Rao CS Environmental Pollution Control Engineering-, Wiley Eastern Ltd., Third Edition, 2023.
- 3. World Commission on Environment and Development (WCED), Our Common Future, Oxford University Press, 2021.

E-RESOURCES

- 1. https://archive.nptel.ac.in/noc/courses/noc19/SEM1/noc19-mg24/
- 2. https://onlinecourses.nptel.ac.in/noc21_mg85/preview

Mapping of Cos-Pos & PSOs

СО	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	3	1	-	-	3	-	1	-	-	1	1	2	2
2	1	1	3	1	-	-	3	-	1	-	-	1	1	2	2
3	1	1	3	1	-	-	3	-	1	-	-	1	1	2	2
4	1	1	3	1	-	-	3	-	1	-	-	1	1	2	2
5	1	1	3	1	-	-	3	-	1	-	-	1	1	2	2
AVG	1	1	3	1	-	-	3	-	1	-	-	1	1	2	2

1 - Low 2 - Medium 3 - High '-' – No Correlation

23MEP505

UNCONVENTIONAL MACHINING PROCESSES

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LTPC 3003

OBJECTIVES

- To learn about the basics of unconventional machining process.
- To understand the working and applications of mechanical energy process.
- To know the working principle and applications of EDM process.
- To study the various chemical and electro chemical process and its applications.
- To learn the concept of thermal energy based machining process.

UNIT I INTRODUCTION

Unconventional machining Process - Need - classification - Brief overview.

UNIT II MECHANICAL ENERGY BASED PROCESSES

Abrasive Jet Machining - Water Jet Machining - Abrasive Water Jet Machining - Ultrasonic Machining.(AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – **MRR-** Applications.

UNIT III ELECTRICAL ENERGY BASED PROCESSES

Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM - Applications.

UNIT IV CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES

Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants - Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications. Principles of ECMequipments-Surface Roughness and MRR Electrical circuit-Process Parameters- ECG and ECH -Applications.

THERMAL ENERGY BASED PROCESSES UNIT V

Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment – Types - Beam control techniques – Applications..

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental principles of unconventional machining processes.
- Apply the suitability of AJM, WJM, AWJM, and USM processes for specific machining tasks or • materials.
- Analyze the EDM process and to know various parameters.
- Describe the typical applications and advantages of CHM and ECM processes.
- Examine the suitability of LBM, PAM, and EBM for specific machining tasks or materials based on • their operational principles and applications





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TEXT BOOKS

- 1. Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., Third Edition 2021.
- 2. Pandey P.C. and Shan H.S. "Modern Machining Processes" Tata McGraw-Hill, Second Edition 2021.
- 3. Dr.S.Senthilkumaran, "Unconventional Machining Process" Veda Publication, Second Edition 2021

REFERENCES

- 1. Paul De Garmo, J.T.Black, and Ronald.A.Kohser, "Material and Processes in Manufacturing" Prentice Hall of India Pvt. Ltd., Eleventh Edition, 2022.
- 2. Mc Geough, "Advanced Methods of Machining", Chapman and Hall, London, 2021
- Vyom Sharma; Mahavir Singh; Amandeep Singh and Janakarajan Ramkumar, "Unconventional Machining Processes - Fundamental Principles and Recent Developments" CBS Publishers, First Edition, 2023

E-RESOURCES

- 1. https://archive.nptel.ac.in/courses/112/105/112105212/
- 2. https://nptel.ac.in/courses/112103202

СО	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	2	1	2	1	3	1	2	-	-	-	-	-	1	2	1
2	2	1	2	1	3	1	2	-	-	-	-	-	1	2	1
3	2	1	2	1	3	1	2	-	-	-	-	-	1	2	1
4	2	1	2	1	3	1	2	-	-	-	-	-	1	2	1
5	2	1	2	1	3	1	2	-	-	-	-	-	1	2	1
AVG	2	1	2	1	3	1	2	-	-	-	-	-	1	2	1

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' – No Correlation



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23MEP506

METAL CASTING PROCESS

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OBJECTIVES

- To learn the principles/methods of casting with detail design of gating/riser system needed for casting.
- To understand the basic principle, procedure and applications of various Foundry and Welding methods.
- To know the principle, thermal and metallurgical aspects during solidification of metal and alloys.
- To acquire a knowledge to the students about the principles of melting and pouring.
- To acquire a knowledge on casting design.

UNIT I CASTING PROCESS

Introduction to casting – pattern – materials allowances – coding – types – moulds – mould making, sand – properties, types and testing of sands – core making – type of cores – single box, two box and three box moulding processes, runner, riser and gate and chills chaplets.

UNIT II SPECIAL CASTING PROCESS

Pressure die casting – Centrifugal – continuous – investment – shell moulding – squeeze – electro slag casting – CO₂ moulding – Plaster Mould castings – Antioch process – Slush casting- Counter gravity low pressure casting – electro-magnetic casting.

UNIT III SOLIDIFICATION PROCESS

Solidification – Definition, nucleation, solidification variables. Directional solidification-need and methods. Degasification in liquid metals-sources of gas, degasification methods. Fettling and cleaning of castings – Basic steps involved. Sand Casting defects- causes, features and remedies. Advantages & limitations of casting process.

UNIT IV MELTING AND POURING

Principles of melting practice-fluxing- Degasification and inoculation- Types of furnaces- Crucibles, Cupola, Oil fired furnaces – Electric arc and induction furnaces –Melting practice of cast iron, S G iron, steel, aluminum and copper alloys.

UNIT V CASTING DESIGN

Solidification of pure metals and alloys-shrinkage in cast metals-design of sprue, runner, gate and risersproblems in design and manufacture of thin and unequal sections – design for directional solidification, minimum distortion and for overall economy – design problems of L,T,V,X and Y junctions.

TOTAL: 45 PERIODS





OUTCOMES

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

- Explain the basics of casting and pattern making
- Describe the functions of special casting process in industry.
- Analyze the solidification process different casting.
- List the various melting and pouring process in casting industry.
- Explain the concepts of design in casting.

TEXT BOOKS

- 1. Paul R. G. P. Andrews, "Casting: An Introduction to Technology and Design", Springer, Third Edition, 2021
- 2. Jain. P.L., "Principle of Foundry Technology", Tata McGraw Hill, Eighth Edition, 2023.
- Anup Goel, "Metal Casting and Welding: Processes and Applications, Technical Publications, First Edition, 2021

REFERENCES

- 1. Taylor HF Fleming, "Foundry Engineering", M.C. and Wiley Eastern Ltd., First Edition, 2020.
- 2. Heime, Looper and Rosenthal, "Principle of metal casting", Tata McGraw Hill, Eighth Edition 2019.
- 3. Mehul Patel, "Metal Casting Processes", Lambert Academic Publication, First Edition 2021

E-RESOURCES

- 1. https://archive.nptel.ac.in/courses/112/107/112107083/
- 2. https://onlinecourses.nptel.ac.in/noc24_me16/preview

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	1	2	1	-	-	-	-	-	1	3	2	2	1
2	2	2	1	2	1	-	-	-	-	-	1	3	2	2	1
3	2	2	1	2	1	-	-	-	-	-	1	3	2	2	1
4	2	2	1	2	1	-	-	-	-	-	1	3	2	2	1
5	2	2	1	2	1	-	-	-	-	-	1	3	2	2	1
AVG	2	2	1	2	1	-	-	-	-	-	1	3	2	2	1

1 - Low 2 - Medium 3 - High '-' - No Correlation

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Page 113

PROFESSIONAL ELECTIVE - II

HYBRID AND VEHICLE TECHNOLOGY

SENGUNTHAR ENGINEERING COLLEGE

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OBJECTIVES

23MEP507

- To understand hybrid electric vehicle (HEV) technologies and their applications.
- To understand hybrid electric drive-train systems and their components.
- To learn about electric propulsion systems used in modern and future transportation technologies.
- To learn the various energy storage technologies, their practical applications, and their critical role in modern energy systems.
- To learn about the principles, methodologies, and practical considerations involved in sizing drive systems.

UNIT I INTRODUCTION TO HYBRID ELECTRIC VEHICLES

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives

UNIT IV ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices

UNIT V SIZING THE DRIVE SYSTEM

Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power 7 20% electronics, selecting the energy storage technology

TOTAL: 45 PERIODS





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OUTCOMES

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

- Explain the fundamentals of HEVs, including their technologies, components, and applications
- Describe Power Management and Control
- Examine the Battery and Energy Storage Systems
- Analyze Different Energy Storage Technologies
- Apply Knowledge to Practical Scenarios of drive system.

TEXT BOOKS

- 1. A.K.Babu, "Electric and Hybrid Vehicles, Khanna Book Publishers, First Edition, 2022
- 2. Stefano Longo, Mehrdad Ehsani, Yimin Gao, "Modern Electric Hybrid Electric & Fuel Cell Vehicles", CRC Press, Third Edition, 2019
- 3. Prof.Shyam M. Ramnani, Prof. Kaustubh R. Kapadani, "Electrical and Hybrid Vehicle" Tech Knowledge Publications, First Edition, 2023

REFERENCES

- James D. Halderman , Curt Ward, "Electric and Hybrid Electric Vehicles" Pearson Publications, First Edition, 2023
- 2. Graham Stoakes," Principles of Electric Vehicle Technology", Second Edition, 2024
- Mary Murphy," Electric and Hybrid Vehicles: Principles, Design and Technology", Larsen & Keller Publisher, First Edition, 2019

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/103/112103262/ (IC Engines and Gas Turbines)
- 2. https://nptel.ac.in/courses/112/104/112104033/ (Engine Combustion)

СО	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	3	2	2	-	-	-	3	-	2	1	1	1
2	3	2	2	3	2	2	-	-	-	3	-	2	1	1	1
3	3	2	2	3	2	2	-	-	-	3	-	2	1	1	1
4	3	2	2	3	2	2	-	-	-	3	-	2	1	1	1
5	3	2	2	3	2	2	-	-	-	3	-	2	1	1	1
AVG.	3	2	2	3	2	2	-	-	-	3	-	2	1	1	1

Mapping of Cos-Pos & PSOs

1- Low 2-Medium 3-High '-' – No Correlation

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23MEP508

OBJECTIVES

• To understand the engine chassis, transmission, steering, suspension system, rear axles and final drive of automobiles.

AUTOMOBILE ENGINEERING

- To acquire knowledge on engine auxiliary system and ignition systems.
- To know about the engine transmission systems.
- To learn the working principle of steering, brakes and suspension systems.
- To acquire skills in the assembly and disassembly of engine parts and transmission systems.

UNIT I VEHICLE STRUCTURE AND ENGINES

Types of automobiles vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC Engines - Components - Functions and materials, Variable Valve Timing (VVT).

UNIT II ENGINE AUXILIARY SYSTEMS

Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system, Ignition system - Types - Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT III TRANSMISSION SYSTEMS

Clutch - Types and construction - Gear boxes - Types - Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints - Differential and rear axle - Hotchkiss drive and torque tube drive.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS

Steering geometry and types of steering gear box - Power Steering - Types of front Axle, Types of suspension systems, Pneumatic and Hydraulic braking systems, Antilock Braking System (ABS), Electronic Brake force Distribution (EBD) and traction control.

UNIT V ALTERNATIVE ENERGY SOURCES

Use of natural gas - Liquefied petroleum gas, bio-diesel, bio-ethanol, gasohol and hydrogen in automobiles - Engine modifications required - Performance, combustion and emission characteristics of SI and CI Engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell.

TOTAL: 45 PERIODS



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OUTCOMES

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

- Describe the various parts of an automobile, including their functions and materials
- Analyze the role of engine auxiliary systems and engine emission control mechanisms.
- Compare the working of different types of transmission systems.
- Classify the types of steering, brake, and suspension systems.
- Analyze possible alternate sources of energy for IC engines.

TEXT BOOKS

- 1. Kirpal Singh, "Automobile Engineering", Vol.1&2, Fourteenth Edition, Standard Publishers 2022.
- 2. R.K.Rajput, "Automobile Engineering", Laxmi Publications, Fifth Edition, 2021.
- 3. Ramesh Chandra Nayak , Debashree Padhi , "Basics of Automobile Engineering" , Lap lambert academic Publishing , Second Edition, 2021

REFERENCES

- 1. Jain and Asthana, "Automobile Engineering", Mc Graw Hill Education, Tenth Edition, 2023.
- 2. Tom Denton, Automobile Electrical & Electronic Systems, Taylor and Francis, Seventh Edition 2022.
- 3. S Chand, A Textbook of Automobile Engineering, S Chand & Co Ltd, Thirteenth Edition 2023

E-RESOURCES

- 1. https://nptel.ac.in/courses/107/106/107106088/ (Fundamentals of Automotive Systems)
- https://www.youtube.com/watch?v=GinzMttVE1M&ab_channel=NPTEL-NOCIITM- (Introduction to Suspension System Part-I)

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	3	2	-	2	-	-	2	3	1	1
2	3	3	3	2	-	3	2	-	2	-	-	2	3	1	1
3	3	3	3	2	-	3	2	-	2	-	-	2	3	1	1
4	3	3	3	2	-	3	2	-	2	-	-	2	3	1	1
5	3	3	3	2	-	3	2	-	2	-	-	2	3	1	1
AVG.	3	3	3	2	-	3	2	-	2	-	-	2	3	1	1

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' – No Correlation





23MEP509 **DESIGN OF HEAT EXCHANGERS** LTPC 3 0 0 3 **OBJECTIVES** To learn the thermal analysis on various parts of the heat exchangers. • To understand stress analysis on various parts of the heat exchangers. To know the sizing and rating of the heat exchangers for various applications. To understand the types of heat exchanger. To acquire a knowledge on condensers and cooling tower. **UNITI** FUNDAMENTALS OF HEAT EXCHANGER 9 Temperature distribution and its implications types - Shell and tube heat exchangers - Regenerators and recuperates - Analysis of heat exchangers - LMTD and effectiveness method. FLOW AND STRESS ANALYSIS UNIT II 9 Effect of turbulence - Friction factor - Pressure loss - Stress in tubes - Header sheets and pressure vessels - Thermal stresses, shear stresses - Types of failures. **UNIT III DESIGN ASPECTS** 9 Heat transfer and pressure loss - Flow configuration - Effect of baffles - Effect of deviations from ideality -Design of double pipe - Finned tube - Shell and tube heat exchangers - Simulation of heat exchangers. **UNIT IV** COMPACT AND PLATE HEAT EXCHANGERS 9 Types - Merits and Demerits - Design of compact heat exchangers, plate heat exchangers - Performance influencing parameters - Limitations. UNIT V CONDENSERS AND COOLING TOWERS 9 Design of surface and evaporative condensers - Cooling tower - Performance characteristics. **TOTAL: 45 PERIODS** OUTCOMES Upon completion of the course, Students will be able to: Interpret the concept of thermal analysis in heat exchangers. Identify and explain the concept of stress analysis in heat exchangers. Design a heat exchanger based on the provided information for a specific application.

- Describe the working principles of different types of heat exchangers.
- Explain the applications and functions of condensers and cooling towers.

TEXT BOOKS

- 1. Sadik Kakac and Hongtan Liu, Heat Exchangers Selection, Rating and Thermal Design, CRC Press, Fourth Edition, 2020
- 2. J.E. Hesselgreaves, Richard Law, et al., "Compact Heat Exchangers: Selection, Design and Operation", Butterworth-Heinemann, Fifth Edition, 2023.
- 3. Manfred Nitsche and Raji Olayiwola Gbadamosi , "Heat Exchanger Design Guide: A Practical Guide for Planning, Selecting and Designing of Shell and Tube Exchangers", Butterworth-Heinemann , Second Edition, 2022





REFERENCES

- 1. Kuppan Thulukkanam, "Heat Exchanger Design Handbook (Mechanical Engineering)", CRC Press, Fourth Edition, 2021.
- 2. Samuel Jorge Marques Cartaxo, "Tubular Heat Exchangers: for Chemical Engineers (De Gruyter Textbook)", De Gruyter, First Edition, 2021.
- 3. Samuel Cartaxo, "Hairpin Heat Exchangers Explained: Fundamentals of Double-Pipe, Multi-Tube and Finned Tube Heat Exchangers", Kindle Edition, First Edition, 2022

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/105/112105248/ (Heat Exchangers: Fundamentals and Design)
- 2. https://nptel.ac.in/courses/103/105/103105140/ (Introduction to Heat Transfer)

СО	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	-	-	-	-	1	1	-	1	3	2	1
2	3	2	1	2	-	-	-	-	1	1	-	1	3	2	1
3	3	2	1	2	-	-	-	-	1	1	-	1	3	2	1
4	3	2	1	2	-	-	-	-	1	1	-	1	3	2	1
5	3	2	1	2	-	-	-	-	1	1	-	1	3	2	1
AVG.	3	2	1	2	-	-	-	-	1	1	-	1	3	2	1

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' - No Correlation





23MEP510

COMPUTATIONAL FLUID DYNAMICS

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OBJECTIVES

- To understand governing equations of viscous fluid flows.
- To learn numerical modeling and its role in the field of fluid flow and heat transfer.
- To know the various discretization methods, solution procedures and turbulence modeling.
- To study the one dimensional and two dimensional elements in finite element techniques for fluid flow problems.
- To understand complex problems in the field of fluid flow and heat transfer by using high speed computers.

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS

Basics of computational fluid dynamics - Governing equations of fluid dynamics - Continuity, momentum and energy equations - Chemical species transport - Physical boundary conditions - Time-averaged equations for Turbulent flow - Kinetic energy equations - Mathematical behaviour of PDEs on CFD - Elliptic, Parabolic and Hyperbolic equations.

UNIT IIFINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION9Derivation of finite difference equations - Simple methods - General methods for first and second orderaccuracy - Finite volume formulation for steady state one, two and three dimensional diffusion problems -Parabolic equations - Explicit and implicit schemes.

UNIT III FINITE VOLUME METHOD FOR CONVECTION DIFFUSION

Steady one-dimensional convection and diffusion - Central, upwind differencing schemes properties of discretization schemes - Conservativeness, boundedness, transportiveness, hybrid power-law, QUICK schemes.

UNIT IV FLOW FIELD ANALYSIS

Finite volume methods - Representation of the pressure gradient term and continuity equation - Staggered grid - Momentum equations - Pressure and velocity corrections - Pressure correction equation, SIMPLE algorithm and its variants - PISO algorithms.

UNIT V TURBULENCE MODELS AND MESH GENERATION

Turbulence models, mixing length model, Two equation (k-€) models - High and low Reynolds number models - Structured grid generation - Unstructured grid generation - Mesh refinement - Adaptive mesh - Software tools.

TOTAL: 45 PERIODS





OUTCOMES

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

- Apply the governing equations and boundary conditions for fluid dynamics.
- Analyze finite difference and finite volume methods for diffusion.
- Analyze finite volume method for convective diffusion.
- Examine flow field problems.
- Solve the turbulence models and mesh generation techniques.

TEXT BOOKS

- 1. Joel H. Ferziger, Milovan Perić, et al., "Computational Methods for Fluid Dynamics", Springer, First Edition, 2022.
- 2. Jiyuan Tu,Guan Heng and Yeoh Chaoqun Liu, "Computational Fluid Dynamics A Practical Approach", Butterworth–Heinemann publishers, UK, Third Edition, 2020.
- 3. Ghoshdastidar, P.S., "Computer Simulation of flow and heat transfer", Tata McGraw Hill Publishing Company Ltd., Third Edition 2019.

REFERENCES

- 1. Oleg Zikanov, "Essential Computational Fluid Dynamics", Wiley, ", Second Edition, 2021.
- 2. Jiri Blazek, "Computational Fluid Dynamics: Principles and Applications", Butterworth-Heinemann, Fourth Edition, 2023.
- 3. Chung, T.J. "Computational Fluid Dynamics", Second Edition, Cambridge University Press, Second Edition, 2022.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/105/112105045/ -(Introduction to Computational Fluid Dynamics)
- https://freevideolectures.com/course/3512/computational-fluid-dynamics-I (Introduction to CFD)

Mapping of Cos-Pos & PSOs

CO	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	1	1	-	-	-	1	-	1	3	2	1
2	3	3	3	1	1	1	-	-	-	1	-	1	3	2	1
3	3	3	3	1	1	1	-	-	-	1	-	1	3	2	1
4	3	3	3	1	1	1	-	-	-	1	-	1	3	2	1
5	3	3	3	1	1	1	-	-	-	1	-	1	3	2	1
AVG.	3	3	3	1	1	1	-	-	-	1	-	1	3	2	1

1 - Low 2 - Medium 3 - High '-' – No Correlation





23MEP511

REFRIGERATION AND AIR CONDITIONING LTPC

(Use of Standard Gas Table Book is Permitted)

OBJECTIVES

- To understand the basics of refrigeration and air conditioning.
- To understand the various refrigeration system and air conditioning.
- To study the various other refrigeration systems.
- To know the basics of psychometric properties and process.
- To understand the cooling load calculation of air conditioning system.

UNIT I INTRODUCTION

Introduction to Refrigeration - Unit of Refrigeration and C.O.P - Ideal cycles - Refrigerants desirable properties - Classification - Nomenclature - ODP and GWP.

VAPOUR COMPRESSION REFRIGERATION SYSTEM **UNIT II**

Vapor compression cycle : p-h and T-s diagrams - Deviations from theoretical cycle - Sub cooling and super heating - Effects of condenser and evaporator pressure on COP - Multipressure system - Low temperature refrigeration - Cascade systems.

OTHER REFRIGERATION SYSTEMS UNIT III

Working principles of vapour absorption systems and adsorption cooling systems - Steam jet refrigeration-Ejector refrigeration systems - Thermoelectric refrigeration - Air refrigeration - Magnetic - Vortex and Pulse tube refrigeration systems.

UNIT IV PSYCHROMETRIC PROPERTIES AND PROCESSES

Properties of moist air - Gibbs Dalton law - Specific humidity - Dew point temperature - Degree of saturation - Relative humidity - Enthalpy - Humid specific heat - Wet Bulb Temperature - Psychometric chart.

UNIT V AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION

Air conditioning loads - Outside and inside design conditions - Infiltration and ventilation - internal heat load - Apparatus selection - fresh air load, human comfort and IAQ principles - Calculation of summer and winter air conditioning load.

OUTCOMES

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

- Examine the basic concepts of refrigeration.
- Explain the vapor compression refrigeration systems and to solve problems.
- Categorize the various types of refrigeration systems.
- Apply the Psychometric properties and its use in Psychometric processes.
- Explain to the concepts of air conditioning and to solve problems.

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TOTAL: 45 PERIODS





TEXT BOOKS

- 1. RS Khurmi, JK Gupta , "Textbook of Refrigeration and Air Conditioning", S chand, Tenth Edition, 2021.
- 2. Andrew D. Althouse , Carl H. Turnquist, et al., "Modern Refrigeration and Air Conditioning , Good heart Willcox, Twentyth Edition, 2024.
- 3. John Tomczyk, Eugene Silberstein , et al., "Refrigeration and Air Conditioning Technology", Cengage Learning, Nineth Edition, 2021.

REFERENCES

- 1. Dick Wirz, Commercial Refrigeration for Air Conditioning Technicians, Cengage Learning, Third Edition, 2021.
- 2. Eugene Silberstein , Jason Obrzut, et al. , "Refrigeration & Air Conditioning Technology", Cengage Learning, Tenth Edition, 2024.
- 3. Chris Johanson "Auto Heating and Air Conditioning", Good heart Willcox, Seventh Edition, 2023.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/105/112105128/ (Refrigeration and Air Conditioning)
- 2. https://nptel.ac.in/courses/112/105/112105129/ (History of Refrigeration)

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	-	1	1	3	2	2	-	2	3	2	1
2	3	2	1	-	-	1	1	3	2	2	-	2	3	2	1
3	3	2	1	-	-	1	1	3	2	2	-	2	3	2	1
4	3	2	1	-	-	1	1	3	2	2	-	2	3	2	1
5	3	2	1	-	-	1	1	3	2	2	-	2	3	2	1
AVG.	3	2	1	-	-	1	1	3	2	2	-	2	3	2	1

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' – No Correlation





23MEP512

SOLAR THERMAL SYSTEMS

L T P C 3 0 0 3

OBJECTIVES

- To understand the concept of solar radiation and solar intensity measuring devices.
- To understand the solar applications like cookers, pumps, ponds etc.,
- To learn the solar utilities under varying operating conditions.
- To acquire knowledge on solar thermal utility working on active and passive modes.
- To study the concept of solar power generation.

UNIT I SOLAR RADIATION

Solar radiation on the earth surface - Extraterrestrial radiation characteristics - Terrestrial radiation - Solar insulation - Solar radiation measuring devices - Pyrheliometer and Pyranometer - Spectral energy distribution of solar radiation - Depletion of solar radiation - Absorption, scattering.

UNIT II SOLAR THERMAL COLLECTORS

Theory of flat plate collectors, evacuated tube collectors and heat pipe based collectors - Performance evaluation - Collector testing - Natural and forced circulation - System configurations - Applications.

UNIT III SOLAR THERMAL UTILITIES - I

Solar air heaters - Theory and applications - Solar drying - Theory, design, performance analysis and types - Solar desalination - Solar still - Types - Theory and performance analysis.

UNIT IV SOLAR THERMAL UTILITIES - II

Solar cooking devices - Solar cooling - Absorption, adsorption and passive systems - Solar thermal pumps - Energy storage - Solar ponds - Solar chimney.

UNIT V SOLAR CONCENTRATORS AND POWER GENERATION

Solar concentrator types - Optics - Performance analysis - Design considerations - Tracking - Solar electric power generation systems - Economics of solar thermal utilities.

TOTAL: 45 PERIODS

OUTCOMES

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

- Examine solar radiation received on a surface using solar radiation measuring devices.
- Classify the solar thermal utilities used for heating and drying applications.
- Analyze the performance of solar utilities under varying operating conditions.
- Apply a solar thermal utility that operates in both active and passive modes.
- Explain the principles, design, and performance of solar power generation.

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TEXT BOOKS

- 1. Goswami Y, Kreith F and Kreider J. F, "Principles of Solar Engineering", CRC Press, Fourth Edition, 2022.
- 2. Sukhatme. S. P, "Solar Energy: Principles of Thermal Collection and Storage", Tata Mc Grawill, Third Edition, 2022.
- 3. Mohsen Sheikholeslami, "Solar Thermal Systems and Applications: New Design Techniques for Improved Thermal Performance (Hybrid Energy Systems)", Academic Press, First Edition, 2024.

REFERENCES

- 1. Pok Ugalde, "Solar Panel And 12-Volt Power Handbook: Planning And Installing Solar Thermal Systems", Second Edition, 2022.
- 2. Prakash J and Garg H, "Solar Energy: Fundamentals and Applications", McGraw Hill Education, Third Edition, 2022.
- Solanki C.S, "Solar Photovoltaics Fundamentals, Technologies and Applications", Prentice Hall India, Second Edition, 2023.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/105/112105050/- (Principles and Performance of Solar energy thermal systems)
- 2. https://nptel.ac.in/courses/112/105/112105051/ (Solar Energy Technology)

СО	PO1	PO2	PO3	PO4	PO5	P06	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	-	-	3	-	3	2	3	-	1	3	2	1
2	3	1	1	-	-	3	-	3	2	3	-	1	3	2	1
3	3	1	1	-	-	3	-	3	2	3	-	1	3	2	1
4	3	1	1	-	-	3	-	3	2	3	-	1	3	2	1
5	3	1	1	-	-	3	-	3	2	3	-	1	3	2	1
AVG.	3	1	1	-	-	3	-	3	2	3	-	1	3	2	1

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' - No Correlation





PROFESSIONAL ELECTIVE - III

23MEP513 PRODUCT DESIGN AND DEVELOPMENT L T P C

3003

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OBJECTIVES

- To learn the characteristics used for product design and development.
- To know about customer requirements in product design.
- To learn structural approach to concept generation, selection and testing.
- To understand various aspects of design such as industrial design, design for manufacture, assembly, service and quality and product architecture.
- To study various principles and technologies used for the preparation of testing.

UNIT I INTRODUCTION

The importance of engineering design – types of design –the design process – relevance of product lifecycle issues in design –designing to codes and standards- societal considerations in engineering design –generic product development process – various phases of product development-planning for products – establishing markets- market segments- relevance of market research.

UNIT II PROJECT MANAGEMENT

Identification of customer needs- customer requirements- Quality Function Deployment Product Design Specifications- Human Factors in Design – Ergonomics and Aesthetics. Societal consideration - Contracts – Product liability – Protecting intellectual property – Legal and ethical domains – Codes of ethics - Ethical conflicts – Environment responsible design-future trends in interaction of engineering with society.

UNIT III REQUIREMENT ANALYSIS

Material Selection Process – Economics – Cost Vs Performance – Weighted property Index – Value Analysis – Role of Processing in Design – Classification of Manufacturing Process – Design for Manufacture – Design for Assembly –Designing for castings, Forging, Metal Forming, Machining and Welding – Residual Stresses – Fatigue, Fracture and Failure.

UNIT IV DESIGN AND DEVELOPMENT

creativity and problem solving- creative thinking methods- generating design concepts - systematic methods for designing –functional decomposition – physical decomposition – functional representation – morphological methods-TRIZ- axiomatic design. Decision making theory- utility theory –decision trees – concept evaluation methods

UNIT V TESTING AND MAINTENANCE

human factors design –user friendly design – design for serviceability – design for environment – prototyping and testing – cost evaluation –categories of cost –overhead costs – activity based costing – methods of developing cost estimates – manufacturing cost –value analysis in costing.

TOTAL: 45 PERIODS





OUTCOMES

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

- Explain the relationships between mechanical design elements.
- Apply mechanical aspects of product design, including concepts, creativity, structure, manufacturing, and aesthetics.
- Solve open-ended problems related to design engineering that meet specified requirements.
- Analyze contemporary issues and their impact on provided solutions.
- Explain the basic testing procedures and maintenance practices.

TEXT BOOKS

- 1. Karl T Ulrich, Steven D.Eppinger, Maria C. Yang, "Product design and development", Eighth Edition, McGraw Hill, 2023.
- 2. Chitale & Gupta "Product Development", Tata McGraw Hill, Third Edition, 2019.
- 3. Gerhard Pahl, Wolfgang Beitz, Jörg Elmar, "Engineering Design: A Systematic Approach", Third Edition, Springer, 2019

REFERENCES

- 1. Yousef Haik, T M MShahin "Engineering Design Process", Cengage Learning, Sixth Edition, 2021
- 2. Niebel & deeper "Product design & process Engineering, McGraw hill, Fourth Edition, 2021.
- 3. Peter G. Rowe, "Design of Product Systems", Wiley Publications, First Edition, 2021

E-RESOURCES

- 1. https://onlinecourses.nptel.ac.in/noc21_me83/preview
- 2. https://archive.nptel.ac.in/courses/112/107/112107217/

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	2	1	-	-	-	-	-	-	1	3	2	1
2	2	1	3	2	1	-	-	-	-	-	-	1	3	2	1
3	2	1	3	2	1	-	-	-	-	-	-	1	3	2	1
4	2	1	3	2	1	-	-	-	-	-	-	1	3	2	1
5	2	1	3	2	1	-	-	-	-	-	-	1	3	2	1
AVG	2	1	3	2	1	-	-	-	-	-	-	1	3	2	1
1 -	Low 2	2 - Mea	dium (3 - Hia	h '-' –	No Co	orrelat	ion							

Mapping of Cos-Pos & PSOs





23MEP514

COMPUTER APPLICATIONS IN DESIGN

LTPC 3003

OBJECTIVES

- To study the fundamental concepts of computer graphics and its tools in a generic framework.
- To understand the parametric fundamentals to create and manipulate geometric models using curves, surfaces and solids,
- To understand the parametric fundamentals to create and manipulate geometric models using NURBS and solids.
- To know clear understanding of CAD systems for 3D modeling and viewing.
- To learn strong skills of assembly modeling and prepare the student to be an effective user of a standards in CAD system.

UNIT I INTRODUCTION TO COMPUTER GRAPHICS FUNDAMENTALS

Overview of Graphics systems: Video Display Devices, Raster-Scan System, Random-Scan Systems, Graphics Monitors and Workstations, Input Devices, Hard-Copy Devices, Graphics Software.

Output primitives: Line Drawing Algorithm - DDA, Bresenham's and Parallel Line Algorithm. Circle generating algorithm – Midpoint Circle Algorithm.

Geometric Transformations: Coordinate Transformations, Windowing and Clipping, 2D Geometric transformations-Translation, Scaling, Shearing, Rotation and Reflection, Composite transformation, 3D transformations.

CURVES AND SURFACES MODELLING UNIT II

Introduction to curves - Analytical curves: line, circle and conics - synthetic curves: Hermite cubic spline-Bezier curve and B-Spline curve – curve manipulations. Introduction to surfaces - Analytical surfaces: Plane surface, ruled surface, surface of revolution and tabulated cylinder – synthetic surfaces: Hermitebicubic surface- Bezier surface and B-Spline surface- surface manipulations.

NURBS AND SOLID MODELING UNIT III

NURBS- Basics- curves, lines, arcs, circle and bi linear surface. Regularized Boolean set operations primitive instancing - sweep representations - boundary representations - constructive solid Geometry comparison of representations - user interface for solid modeling.

UNIT IV VISUAL REALISM

Hidden Line removal, Hidden Surface removal, – Hidden Solid Removal algorithms - Shading – Coloring. Animation - Conventional, Computer animation, Engineering animation - types and techniques

UNIT V ASSEMBLY OF PARTS AND PRODUCT LIFE CYCLE MANAGEMENT

Assembly modeling – Design for manufacture – Design for assembly – computer aided DFMA - inferences of positions and orientation - tolerances analysis -Center of Gravity and mass property calculations mechanism simulation. Graphics and computing standards - Data Exchange standards. Product development and management - new product development -models utilized in various phases of new product development - managing product life cycle..

TOTAL: 45 PERIODS

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OUTCOMES

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

- Solve 2D and 3D transformations for the basic entities like line and circle
- Apply the fundamental mathematical concepts required for CAD systems, ensuring accurate geometric representation and manipulation
- Apply various geometric modeling techniques, such as feature-based modeling, surface modeling, and solid modeling.
- Examine geometric models through animation and transform them into real-world systems.
- Analyze the assembly of parts using Computer-Aided Design software

TEXT BOOKS

- 1. Chitale A.K and Gupta R.C "Product design and manufacturing " PHI learning private limited, Third Edition, 2021.
- John W. Stauffer and Edward J. Haug, "Principles of Computer-Aided Design and Manufacturing" Wiley Publication, Second Edition, 2019
- Milos Sojat, Zeljko Dorđevic, "Computer-Aided Design and Manufacturing" Springer Publication, First Edition, 2020

REFERENCES

- 1. William M Newman and Robert F.Sproull "Principles of Interactive Computer Graphics", McGraw Hill Book Co. First Edition, 2001.
- 2. Gary R. Gilbert, "Introduction to Computer Numerical Control" Pearson, Fourth Edition, 2020
- 3. Chris McMahon and Jimmie Browne ,"CAD/CAM: Concepts and Applications" McGraw-Hill Education, First Edition, 2019

E-RESOURCES

- 1. https://nptel.ac.in/courses/112104031
- 2. https://onlinecourses.nptel.ac.in/noc22_cs38/preview

Mapping of Cos-Pos & PSOs

со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1	3	3	2	-	-	-	-	-	2	1	1	2
2	1	2	1	3	3	2	-	-	-	-	-	2	1	1	2
3	1	2	1	3	3	2	-	-	-	-	-	2	1	1	2
4	1	2	1	3	3	2	-	-	-	-	-	2	1	1	2
5	1	2	1	3	3	2	-	-	-	-	-	2	1	1	2
AVG	1	2	1	3	3	2	-	-	-	-	-	2	1	1	2

1 - Low 2 - Medium 3 - High '-' – No Correlation





23MEP515

FLUID POWER SYSTEMS

L T P C 3 0 0 3

OBJECTIVES

OUTCOMES

- To study the different components in hydraulic and pneumatic system.
- To learn the working principles, operation of hydraulic components.
- To learn the working principles, operation of pneumatic components.
- To study the various techniques of circuit building in hydraulics and pneumatics.
- To understand problems and troubles in fluid power systems.

UNIT I FUNDAMENTALS OF FLUID POWER SYSTEMS

Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids - Properties of fluids and selection – Basics of Hydraulics – Pascal's Law – Principles of flow

UNIT II HYDRAULIC CONTROL SYSTEMS

Introduction - Hydraulic pumps, Actuators, Motors – types and construction details, Cushioning mechanism, Valves - direction, flow and pressure - types and construction details.

UNIT III PNEUMATIC CONTROL SYSTEMS

Introduction - Properties of air, Compressors – types - construction details, Filter - Regulator and Lubricator unit, Actuators – types and construction details, Valves - direction, flow and pressure – types and construction details.

UNIT IV INDUSTRIAL APPLICATION OF FLUID POWER SYSTEMS

Speed control circuits, Regenerative circuits, Feed circuits, Sequencing circuits, Synchronizing circuits, Fail-safe circuits, Cascade method, Accumulators and Intensifier circuits and its applications.

UNIT V RECENT TRENDS IN FLUID POWER SYSTEMS

Servo systems – Proportional valves. Fluidics – Introduction to fluidic devices - simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control- Low cost Automation – Hydraulic and Pneumatic power packs.

TOTAL : 45 PERIODS

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

- Categorize fluid power components used in industry and select a suitable pump for a hydraulic power pack.
- Explain the types, working principles, and performance of pumps and actuators in hydraulic systems.
- Summarize the types and functions of control valves in pneumatic systems.
- Design and develop hydraulic and pneumatic circuits for simple industrial applications.
- Design, install, and maintain fluid power circuits for engineering applications.

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TEXT BOOKS

- 1. Anthony Esposito, "Fluid Power with Applications", Pearson Education Asia Delhi, Eigth Edition, 2020.
- 2. Majumdar S.R., "Oil Hydraulics Systems", Tata McGraw-Hill Education India, Third Edition, 2020.
- 3. Shanmugasundaram K, Hydraulic and Pneumatic Controls, Chand & Co, Second Edition, 2022.

REFERENCES

- 1. Ilango S, Soundararajan V, "Introduction to Hydraulics and Pneumatics", Prentice hall of India, New Delhi, Second Edition, 2022.
- Jagadeesha.T., "Pneumatics Concepts, Design and Applications", Universities Press, First Edition, 2020.
- 3. Srinivasan.R., "Hydraulic and Pneumatic Controls", Vijay Nicole Imprints, First Edition, 2021.

E-RESOURCES

- 1. https://archive.nptel.ac.in/courses/112/106/112106300/ (oil Hydraulics and Pneumatics)
- 2. https://www.digimat.in/nptel/courses/video/112106300/L81.html (Pump control Hydraulic Systems)

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	2	-	-	-	-	-	-	1	2	2	1
2	2	1	1	1	2	-	-	-	-	-	-	1	2	2	1
3	2	1	1	1	2	-	-	-	-	-	-	1	2	2	1
4	2	1	1	1	2	-	-	-	-	-	-	1	2	2	1
5	2	1	1	1	2	-	-	-	-	-	-	1	2	2	1
AVG	2	1	1	1	2	-	-	-	-	-	-	1	2	2	1

Mapping of Cos-Pos & PSOs

1 - Low 2 - Medium 3 - High '-' – No Correlation



SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS) (Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai) Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956 NAAC Accredited with 'A' Grade

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23MEP516

PROCESS PLANNING AND COST ESTIMATION

LT P C 3 0 0 3

OBJECTIVES

- To understand the steps involved in process planning and computer aided process planning.
- To study the process parameter calculation for various production process.
- To acquire knowledge on elements and estimation of cost, material cost and weight estimation.
- To study the estimate the production cost.
- To learn the techniques in estimation of time and cost of machining, forging and welding.

UNIT I INTRODUCTION TO PROCESS PLANNING

Introduction - Methods of process planning - Drawing interpretation - Material evaluation - Steps in process selection - Production equipment and tooling selection.

UNIT II PROCESS PLANNING ACTIVITIES

Process parameters calculation for various production processes - Selection jigs and fixtures - Selection of quality assurance methods - Set of documents for process planning - Economics of process planning - Case studies.

UNIT III INTRODUCTION TO COST ESTIMATION

Importance of costing and estimation - Methods of costing - Elements of cost estimation -Types of estimates -Estimating procedure - Estimation labor cost, material cost - Allocation of overhead charges - Calculation of depreciation cost.

UNIT IV PRODUCTION COST ESTIMATION

Estimation of different types of jobs - Estimation of forging shop - Estimation of welding shop - Estimation of foundry shop.

UNIT V MACHINING TIME CALCULATION

Estimation of machining Time - Importance of machine time calculation - Calculation of machining Time for different lathe operations - Drilling and boring - Machining time calculation for milling, shaping and planning - Machining time calculation for grinding.

TOTAL: 45 PERIODS

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

OUTCOMES

- Summarize the steps involved in process planning and/or computer aided process planning.
- Categorize the elements of cost during manufacture of a product and/or apply the methods to estimate the cost.
- Estimate the material cost weight for a particular part.
- Determine the machining time of material removal processes in lathe, milling, shaping, planning and grinding.
- Apply methods of estimation in forging and welding processes to determine the cost of the process.

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TEXT BOOKS

- 1. Ostwalal P.F. and Munez J., "Manufacturing Processes and systems, John Wiley", Sixth Edition, 2021.
- 2. Dr.V.Jayakumar, "Process Planning and Cost Estimation", Lakshmi publications, Chennai, Second Edition, 2023.
- **3.** Panneerselvam R, "Process Planning and Cost Estimation, PHI Learning Pvt Ltd, Second Edition, 2020.

REFERENCES

- 1. Davim, J. Paulo, Jain, Ajai, Phanden, Rakesh Kumar "Integration of process planning and scheduling: approaches and algorithms" CRC Press/Taylor & Francis Group, First Edition, 2021.
- 2. R. Kesavan, C. Elanchezhian, B. Vijaya ramnath "Process Planning and Cost Estimation", New Age International (P) Limited, First Edition, 2023.
- L.Kamaludeen, PR Andiappan," Process, Planning and Cost Estimation", N.V Publications, Second Edition, 2021

E-RESOURCES

- 1. https://nptel.ac.in/courses/110/101/110101132/ (Cost Accounting)
- 2. https://youtu.be/y24meNZbUoU (Process Planning)

со	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1
2	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1
3	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1
4	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1
5	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1
Avg	3	3	2	2	1	-	-	-	-	-	1	2	2	-	1

Mapping of Cos-Pos & PSOs

1-Low 2-Medium 3-High '-' – No Correlation





23MEP517

POWER PLANT ENGINEERING

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OBJECTIVES

OUTCOMES

- To acquire knowledge on working principle of steam power plant.
- To understand the working principle of diesel power plant.
- To understand the principles and operation of nuclear power plant.
- To know the principles and operation of power plant working on renewable energy.
- To understand energy, economic and environmental issues of power plants.

UNIT I STEAM POWER PLANTS

Layout of modern coal power plant - Super Critical Boilers - FBC Boilers - Turbines, Condensers, Subsystems of thermal power plants - Fuel and ash handling - Draught system - Feed water treatment - Binary cycles and cogeneration systems.

UNIT II DIESEL AND COMBINED CYCLE POWER PLANTS

Components of Diesel - Fuel system - Common Rail Injection - Individual pump injection - Distributor system - Combined cycle power plants - Integrated Gasifier based combined cycle systems.

UNIT III NUCLEAR POWER PLANTS

Basics of Nuclear Engineering - Layout and parts - Nuclear Reactors: Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium - Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors - Safety measures.

UNIT IV RENEWABLE ENERGY

Hydro Electric Power Plants - Classification, Layout and component - Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel cell power systems.

UNIT V ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL: 45 PERIODS

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

- Describe the layout, construction, and operation of components inside a thermal power plant.
- Explain the layout, construction, and operation of components inside diesel and combined cycle power plants.
- Summarize the functioning of the components inside nuclear power plants.
- Classify different types of energy sources and explain the layout, construction, and operation of components inside renewable energy power plants.
- Categorize the applications of power plants and analyze power plant economics and environmental hazards, as well as estimate the costs of electrical energy production.





TEXT BOOKS

- 1. Nag. P.K., "Power Plant Engineering", Tata McGraw Hill Publishing Company Ltd., Fifth Edition, 2021.
- 2. R. K. Rajput, " A Textbook of Power Plant Engineering", laxmi publications, Second Edition, 2020.
- Dipak Kumar Mandal, Somnath Chakrabarti, Arup Kumar Das," Power Plant Engineering: Theory and Practice" Wiley Publications, First Edition, 2023

REFERENCES

- 1. R.K.Jain, "Power Plant Technology", Khanna Publishers, Second Edition, 2020.
- Philip Kiameh, "Power Generation Handbook", Tata McGraw Hill Publishing Company Ltd., Third Edition, 2022.
- 3. B. Vijaya Ramnath C. Elanchezhian, L. Saravanakumar, "Power Plant Engineering", Wiley publications, First Edition, 2023.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112/107/112107291/ (Power Plant Engineering)
- https://www.youtube.com/watch?v=iWWyI8CZhUw (Introduction to Power Plant Engineering)

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	1		1	3			1		1	2	2	1
2	3	1	1	1		1	3			1		1	2	2	1
3	3	1	1	1		1	3			1		1	2	2	1
4	3	1	1	1		1	3			1		1	2	2	1
5	3	1	1	1		1	3			1		1	2	2	1
AVG	3	1	1	1		1	3			1		1	2	2	1

Mapping of Cos-Pos & PSOs

1- Low 2-Medium 3-High '-' – No Correlation





23MEP518

RAPID PROTOTYPING

L T P C 3 0 0 3

OBJECTIVES

- To study the basic concept of Rapid Prototyping.
- To learn the various design process of additive manufacturing.
- To know the various CAD modeling process.
- To know the basic principles in FDM process.
- To understand the various testing and maintenance in rapid prototyping process.

UNIT I INTRODUCTION

Overview -Need -Development of Additive Manufacturing Technology -Principle – AM Process Chain-Classification -Rapid Prototyping-Rapid Tooling -Rapid Manufacturing – Applications-Benefits -Case studies.

UNIT II DESIGN FOR ADDITIVE MANUFACTURING

Design tools: Data processing -CAD model preparation -Part orientation and support structure generation -Model slicing -Tool path generation-Design for Additive Manufacturing: Concepts and objectives-AM unique capabilities -DFAM for part quality improvement-Customized design and fabrication for medical applications.

UNIT III CAD MODELLING AND DATA PROCESSING FOR RP

CAD model preparation, Data interfacing: formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), conversation, validity checks, repair procedures; Part orientation and support generation, Support structure design, Model Slicing algorithms and contour data organization, direct and adaptive slicing, Tool path generation.

UNIT IV EXTRUSION BASED AND SHEET LAMINATION PROCESSES

Extrusion Based System: FDM-Introduction -Basic Principle -Materials -Applications and Limitations -Bio extrusion. Sheet Lamination Process: LOM-Gluing or Adhesive bonding -Thermal bonding.

UNIT V TESTING AND MAINTENANCE

Droplet formation technologies -Continuous mode -Drop on Demand mode -Three Dimensional Printing -Advantages -Bioplotter -Beam Deposition Process: LENS-Process description -Material delivery -Process parameters -Materials -Benefits -Applications..

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply the basics of Additive manufacturing.
- Design and assembly of various parts for the desired task.
- Explain the process involved in laser and UV based AM
- Illustrate the process of fused deposition moulding and sheet lamination
- Analyze design and manufacturing case studies relevant to mass customized manufacturing, and evaluate key research challenges associated with additive manufacturing (AM) and its data processing tool

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TEXT BOOKS

- 1. Liou, L.W. and Liou, F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, First Edition, 2024.
- 2. Chua, C.K., Leong K.F. and Lim C.S., "Rapid prototyping: Principles and applications", World Scientific Publishers, Fourth Edition, 2022.
- 3. Chee Kai & K F Leong Chua, "Rapid Prototyping: 3D Printing and Additive Manufacturing Principles and Applications", Fourth Edition, 2022

REFERENCES

- 1. Gibson, I., Rosen, D.W. and Stucker, B., "Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, Second Edition, 2021.
- 2. Kamrani, A.K. and Nasr, E.A., "Rapid Prototyping: Theory and practice", Springer, Second Edition, 2022.
- 3. Chee Kai Chua, "Innovation in 3D Printing Technology", First Edition, 2024

E-RESOURCES

- 1. https://onlinecourses.nptel.ac.in/noc22_me74/preview
- 2. https://archive.nptel.ac.in/courses/112/103/112103306/

со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	1	2	-	-	-		-	-	2	2	2	1
2	3	2	3	1	2	-	-	-	-	-	-	2	2	2	1
3	3	2	3	1	2	-	-	-	-	-	-	2	2	2	1
4	3	2	3	1	2	-	-	-	-	-	-	2	2	2	1
5	3	2	3	1	2	-	-	-	-	-	-	2	2	2	1
AVG	3	2	3	1	2	-	-	-	-	-	-	2	2	2	1

Mapping of Cos-Pos & PSOs

1-Low 2-Medium 3-High '-'- No Correlation





CURRICULUM AND SYLLABI FOR B.E. / B.Tech. DEGREE PROGRAMMES (For the Students Admitted in the Academic Year 2023 - 2024 onwards)

CREDIT SUMMARY

B.E. MECHANICAL ENGINEERING

Catagony		Credits Per Semester												
Category	I	II	III	IV	v	VI	VII	VIII	Total					
HS	4	7	-	-	-	-	3	-	14					
BS	12	8	4	-	-	-	-	-	24					
ES	4	6	4	4	-	-	-	-	18					
PC	-	3	16	15	12	8	-	-	54					
PE	-	-	-	-	9	9	-	-	18					
GE	-	-	-	-	-	-	3	-	03					
OE	-	-	-	-	-	3	6	-	09					
EEC	1	2	1	3	2	4	4	8	25					
MC	-	-	-		-	-	-	-	-					
Total	21	26	25	22	23	24	16	08	165					



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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

MINOR DEGREE/HONOURS

B.E. – MECH (MECHANICAL)



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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

DEPARTMENT OF MECHANICAL ENGINEERING

REGULATION - 2023

(Revised)

(III - VII SEMESTERS)

MINOR DEGREE / HONOURS INDUSTRIAL SAFETY ENGINEERING

CURRICULUM AND SYLLABI







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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(MINOR DEGREE / HONOURS - INDUSTRIAL SAFETY ENGINEERING)

B.E - MECHANICAL ENGINEERING

Course Code	Name of the Subject	Category	Pe	erioc Wee	ls / k	Credit	Max	Maximum Marks			
			L	Τ	Ρ	С	CIA	ESE	тот		
THEORY											
23MEIT01	Safety Management	PC	3	0	0	3	40	60	100		
23MEIT02	Industrial Safety, Health and Environment (SHE) Acts	PC	3	0	0	3	40	60	100		
23MEIT03	Fire Engineering and Explosion Control	PC	3	0	0	3	40	60	100		
EMBEDDED	COURSE										
23MEIE01	Safety in Engineering Industry	PC	3	0	2	4	50	50	100		
EMPLOYABILITY ENHANCEMENT COURSE											
23MEIP01	Project Work	EEC	0	0	12	6	60	40	100		
	TOTAL CREDITS 19										

PC	:	Professional Core
EEC	:	Employability Enhancement Courses
L	:	Lecture
Т	:	Tutorial
Р	:	Practical
С	:	Credit Point
CIA	:	Continuous Internal Assessment
ESE	:	End Semester Examination
ТОТ	:	Total


GUNTHA SENGUNTHAR ENGINEERING COLLEGE ESTD 2001

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23MEIT01

SAFETY MANAGEMENT

LTPC 3003

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OBJECTIVES

- To learn the safety management function and techniques
- To understand the basic principles of safety audit •
- To know the accident reporting and investigation procedure •
- To study the safety performance monitoring and accident data analysis. •
- To learn the safety education and training, evaluation of safety performance in an organization.

UNIT I CONCEPTS AND TECHNIQUES

Content Evolution of modern safety concept - Safety Management functions - planning for safety for optimization of productivity - productivity, quality and safety - line and staff functions for safety safety committee - budgeting for safety - safety policy - Statutory Provisions for safety management. Incident Recall Technique (IRT), safety survey, safety inspection, safety sampling, Safety Audit.

UNIT II SAFETY AUDIT

Components of safety audit, types of audit, audit methodology, non conformity reporting (NCR), audit checklist and report - review of inspection, remarks by government agencies, consultants, experts - perusal of accident and safety records, formats - implementation of audit indication identification of unsafe acts of workers and unsafe conditions in the shop floor

UNIT III ACCIDENT INVESTIGATION AND REPORTING

Basic Principle of Accident & Prevention concept of an accident, reportable and non reportable accidents, reporting to statutory authorities - principles of accident prevention - accident investigation and reporting - Accident analysis - based on causes & injury - records for accidents, departmental accident reports, documentation of accidents - unsafe act and condition - Accident causation theories - domino sequence - supervisory role - role of safety committee - cost of accident

UNIT IV SAFETY PERFORMANCE MONITORING

Reactive and proactive monitoring techniques, frequency severity incidence, incident rate, accident rate, safety "t" score, safety activity rate) Recommended practices for compiling and measuring work injury experience - permanent total disabilities, permanent partial disabilities accident data analysis.

UNIT V SAFETY EDUCATION AND TRAINING

Importance of training - identification of training needs - training methods such as hands on training and tabletop exercise - Programme, seminars, conferences, competitions - method of promoting safe practice - motivation -

communication -safety attitude and culture - role of government agencies and private consulting agencies in safety training - creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign - Domestic Safety and Training.





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OUTCOMES

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

- Apply principles of safety management, its function and technique in any organization.
- Examine safety audit and to prepare a report for the audit. •
- Illustrate the knowledge on the principles of accident and its control methods. •
- Analyze the accident cost using supervisors report and data. •
- Explain the roles of various agencies involved in safety education and training.

TEXT BOOKS

- 1. Philip R. Harris., "Industrial Safety and Health for Small Businesses", Prentice Hall Inc, Third Edition, 2020.
- 2. National Safety Council, "Accident Prevention Manual for Business & Industry: Engineering & Technology", Fifteenth Edition, 2022.
- 3. C. Ray Asfahl, David W. Rieske, "Industrial Safety and Health Management", Pearson, Seventh Edition, 2019

REFERENCES

- 1. Charles D. Reese, "Occupational Health and Safety Management: A Practical Approach", CRC Press, Third Edition, 2021.
- 2. Frank Crawley, Ian Sutton, "Loss Prevention in the Process Industries: Volume 1 -Fundamental Principles and Methods", Elsevier, Third Edition, 2022.
- 3. Gupta, R.S., "Handbook of Safety Management: A Practical Approach" CRC Press, Second Edition, 2020.

E-RESOURCES

- https://www.youtube.com/watch?v=M0fjtV9nPJY (Theories of accident causation)
- https://www.safetyproresources.com/blog/9-steps-for_accident-investigations-(OSHA inspection process)

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
3	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
4	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
5	2	1	1	-	-	1	2	-	-	-	1	1	2	1	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	1	1	-	-	1	2	-	-	-	1	1	2	2	2

Mapping of Cos-Pos & PSOs



SEC - UG - R2023 / JUNE - 2024 (REVISED)

SEMESTER IV

TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

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23MEIT02 INDUSTRIAL SAFETY, HEALTH AND ENVIRONMENT (SHE) ACTS LT P C

OBJECTIVES

- To learn the health and welfare provisions as given in factories act.
- To understand the environment act with respect to air and water pollution.
- To know about the Manufacture, storage and import of chemical rules.
- To study the other acts and rules pertaining to health and safety.
- To learn the various International acts and standards

UNIT I FACTORIES ACT - 1948

Statutory authorities - inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young person's - special provisions - penalties and procedures - Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948, forms, registers and notices - Amendments.

UNIT II ENVIRONMENT ACT - 1986

General powers of the central government, prevention, control and abatement of environmental pollution - Biomedical waste (Management and Handling) Rules, 1989 - The Noise Pollution (Regulation and control) Rules, 2000 - The Batteries (Management and Handling) Rules, 2001 - No Objection certificate from statutory authorities like pollution control board.

UNIT III MANUFACTURE, STORAGE AND IMPORT OF CHEMICAL RULES 1989

Definitions - duties of authorities - responsibilities of occupier - notification of major accidents - information to be furnished - preparation of offsite and onsite plans - list of hazardous and toxic chemicals - safety reports - safety data sheets.

UNIT IV OTHER ACTS AND RULES

Indian Boiler Act 1923, Static and Mobile Pressure Vessel Rules (SMPV), Motor Vehicle Rules, Mines Act 1952, Workman Compensation Act, Rules - Electricity Act and Rules - Hazardous Wastes (Management and Handling) Rules, 1989, with amendments in 2000 - The Building and Other Construction Workers Act 1996., Petroleum rules, Gas cylinder rules - Explosives Act 1983 - Pesticides Act.

UNIT V INTERNATIONAL ACTS AND STANDARDS

Occupational Safety and Health Act of USA (The Williams - Steiger Act of 1970) - Health and Safety Work Act (HASAWA) 1974, UK - SHAS 18001 - ISO 45001 - American National Standards Institute (ANSI).

BENGUNTHAR

TOTAL : 45 PERIODS

Page 141





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OUTCOMES

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

- Identify the health and welfare provisions as given in factories act
- Examine the knowledge on environment act with respect to air and water pollution.
- Analyze the responsibilities of occupier according to manufacture, storage and import of chemical rules.
- Examine the other legislation acts pertaining to health and safety.
- Explain the various international acts and rules.

TEXT BOOKS

- 1. The Factories Act 1948, Madras Book Agency, Chennai, Second Edition, 2015.
- 2. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt. Ltd., Second Edition, 2019.
- 3. Danuta Koradecka, "Handbook of Occupational Health and Safety", CRC, 2015.

REFERENCES

- 1. The Indian boilers act 1923, Commercial Law Publishers (India) Pvt. Ltd., Allahabad, Second Edition, 2016.
- The Mines Act 1952, Commercial Law Publishers (India) Pvt. Ltd., Allahabad, Second Edition, 2019.
- 3. S.P.Mahajan, "Pollution control in process industries", Tata McGraw Hill Publishing Company, 2015.

E-RESOURCES

- 1. https://nptel.ac.in/courses/120108004 (Environment Management)
- 2. https://www.youtube.com/watch?v=9QM-3LMeBQA (Factories Act)

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	1	-	1	2	-	2	-	1	1	3	2	2
2	2	2	-	1	-	1	2	-	2	-	1	1	3	2	2
3	2	2	-	1	-	1	2	-	2	-	1	1	3	2	2
4	2	2	-	1	-	1	2	-	2	-	1	1	3	2	2
5	2	2	-	1	-	1	2	-	2	-	1	1	3	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	2	-	1	-	1	2	-	-	-	1	1	3	2	2

Mapping of Cos-Pos & PSOs







Page 143

JAS-ANZ BSCIC ISO 9001 REGISTERED

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SEMESTER V

FIRE ENGINEERING AND EXPLOSION CONTROL

23MEIT03

OBJECTIVES To study the principles of fire and explosion and characteristics of various materials. •

- To understand the design of fire prevention and suppression systems.
- To study the variety of industrial fire protection systems. •
- To know different building fire safety and structural fire protection. •
- To learn various explosion protecting systems.

UNIT I PHYSICS AND CHEMISTRY OF FIRE

Fire properties of solid, liquid and gases - fire spread - toxicity of products of combustion - theory of combustion and explosion - vapour clouds - flash fire - pool fires - unconfined vapour cloud explosion, shock waves - auto - ignition - boiling liquid expanding vapour explosion - case studies -Flixborough, Mexico disaster, Piper Alpha, Peterborough & Bombay Victoria dock ship explosions. 9

UNIT II FIRE PREVENTION AND PROTECTION

Sources of ignition - fire triangle - principles of fire extinguishing - active and passive fire protection systems - various classes of fires - A, B, C, D - types of fire extinguishers - fire stoppers - hydrant pipes - hoses - monitors

- fire watchers - layout of stand pipes - fire station - fire alarms and sirens - maintenance of fire trucks - foam generators - escape from fire rescue operations - fire drills - notice - first aid for burns. 9

UNIT III INDUSTRIAL FIRE PROTECTION SYSTEMS

Sprinkler - hydrants - stand pipes - special fire suppression systems like deluge and emulsifier, selection criteria of the above installations, reliability, maintenance, evaluation and standards alarm and detection systems. Other suppression systems - CO₂ system, foam system, dry chemical powder (DCP) system and halon system - need for halon replacement - smoke venting. Portable extinguishers - flammable liquids - tank farms - indices of inflammability - fire fighting

UNIT IV BUILDING FIRE SAFETY

Objectives of fire safe building design, fire load, fire resistant material and fire testing - structural fire protection - structural integrity - concept of egress design - exits - width calculations - fire certificates - fire safety requirements for high rise buildings - snookers.

UNIT V **EXPLOSION PROTECTING SYSTEMS**

Principles of explosion - detonation and blast waves - explosion parameters -Explosion Protection, Containment, Flame Arrestors, , suppression, venting, explosion relief of large enclosure - explosion venting - inert gases, plant isolation for generation of inert gas - rupture disc in process vessels and lines explosion, suppression system based on carbon dioxide (CO₂) and halons hazards in LPG, ammonia (NH_3), sulphur dioxide (SO_3), chlorine (Cl_2) etc.

TOTAL: 45 PERIODS



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OUTCOMES

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

- Explain the fire properties of solid, liquid and gases and understand the principle of fire and combustion theory.
- Describe about the fire prevention and fire protection systems.
- Categorize the sources of ignition, classes of fires and their extinguishing medium
- Apply the objective of building fire safety and relevant standards.
- Apply the principles of explosion and understand about their protecting systems.

TEXT BOOKS

- 1. Venkatesh Kodur, Mohammad Naser, "Structural fire engineering", McGraw-Hill Publishing Company, Twentieth Edition, 2020.
- 2. National Fire Protection Association, "Guide for Fire and explosion Investigations", NFPA, Sixteenth Edition, 2016.
- 3. Lon H. Ferguson, Christopher A Janicak, "Fundamentals of Fire Protection for the safety professionals", Government Institutes, Inc, Second Edition, 2015.

REFERENCES

- 1. Dennis P. Nolan, "Fire pump arrangements at industrial facilities", Elsevier science, Third Edition, 2017
- 2. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, Nineth Edition, 2016.
- 3. Martin Gillie, Yong Wang, "Applications of Fire Engineering", CRC Press, 2017.

E-RESOURCES

- https://nptel.ac.in/courses/105102176 (Fire Protection, Services and Maintenance Management ofBuilding)
- 2. https://onlinecourses.nptel.ac.in/noc21_me28/preview (Explosions and Safety)

Mapping of Cos-Pos & PSOs

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	-	1	2	-	2	1	-	1	3	2	2
2	3	2	1	2	-	1	2	-	2	1	-	1	3	2	2
3	3	2	1	2	-	1	2	-	2	1	-	1	3	2	2
4	3	2	1	2	-	1	2	-	2	1	-	1	3	2	2
5	3	2	1	2	-	1	2	-	2	1	-	1	3	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	1	2	-	1	2	-	-	1	-	1	3	2	2





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SEMESTER VI

23MEPS301

SAFETY IN ENGINEERING INDUSTRY

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OBJECTIVES

- To study the workplace hazards in a manufacturing engineering industry
- To understand the control of hazards and usage of proper personal protective equipment.
- To know safety in welding and gas cutting.
- To know safety in cold farming and hot working of metals.
- To learn safety in finishing, inspection and testing.

UNIT I SAFETY IN METAL WORKING MACHINERY AND WOOD WORKING MACHINES 9

General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes - saws, types, Hazards.

UNIT II PRINCIPLES OF MACHINE GUARDING

Design aspects of machine guarding, Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening.

UNIT III SAFETY IN WELDING AND GAS CUTTING

Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing - explosive welding, selection, care and maintenance of the associated equipment and instruments - safety in generation, distribution and handling of industrial gases - colour coding

UNIT IV SAFETY IN COLD FARMING AND HOT WORKING OF METALS

Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot - operated presses, power press electric controls, power press set up and die removal, inspection and maintenance - metal shears-press brakes. Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills - hot bending of pipes, hazards and control measures. Safety in gas furnace operation, cupola, crucibles, ovens, foundry health hazards, work environment, material handling in foundries, foundry production cleaning and finishing foundry processes.





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UNIT V SAFETY IN FINISHING, INSPECTION AND TESTING

Heat treatment operations, electro plating, paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards, engineering and administrative controls, Indian Boilers Regulation. Health and welfare measures in engineering industry - pollution control in engineering industry - industrial waste disposal.

LIST OF EXPERIMENTS

- 1. Carryout the Noise level Measurement for a given area and compare with the standards.
- 2. Find the illumination level of a given area using the Lux meter.
- 3. Find the percentage of CO₂, CO, SO₂ and O₂ present in the exhaust gas of a given diesel/petrol engineusing Exhaust gas analyzer under different loading conditions.
- 4. Find the total mass of the suspended particulate matter in a given area using the respirable dust sampler.
- 5. Determine the earth resistance and resistivity by using the earth resistance for the given soil.
- 6. Find the insulation resistance for the given motor and cable using insulation tester.
- 7. Identify the given PPE's and explain in detail about its usage.
- 8. Identify the various types of fire extinguishers and elaborate in detail about its operation and method of extinguishing.
- 9. Find the toxic and flammable level of the given chemical using dispersion modeling (ALOHA) software.
- 10. What is meant by First-aid and what are the items to be kept in the first-aid box? Explain briefly.

TOTAL: 45 PERIODS

	LIST	OF EQUIPMENTS
1.	Noise level meter	- 1 no.
2.	Lux meter	- 1 no.
3.	Exhaust gas analyzer	- 1 no.
4.	Respirable dust sampler	- 1 no.
5.	Earth resistance tester	- 1 no.
6.	Insulation tester	- 1 no.
7.	PPE set	- 1 no.
8.	Fire extinguisher set	- 1 no.
9.	ALOHA Software (*on-line – trial ver	rsion) - 1 no.
10	First-aid kit	- 1 no.





JAS-ANZ

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OUTCOMES

Upon completion of the course, Students will be able to

- Determine the General safety rules, principles, maintenance, Inspections of metal and wood workingmachinery
- Apply the concepts of safety in design, use and maintenance of machines.
- Describe welding, common hazards in welding, personal protective equipment and safety precautions in welding.
- Analyze the safety in cold working and hot working of metals.
- Examine the safety in finishing, inspection and testing of machines.

TEXT BOOKS

- 1. Frank R Spellman, "Safety Engineering principles and practices", Rowman & Littlefield, Third Edition, 2018.
- 2. C Ray Ashafl, David W. Rieske, "Industrial Safety and Health Management", Pearson, Seventh Edition, 2018.
- 3. David Goetsch, "The Basics of Occupational Safety", Pearson, Third Edition, 2018.

REFERENCES

- 1. Wiley, "Process Safety for Engineers An Introduction", Wiley Al-che, Second Edition, 2022.
- 2. W. David Yates, "Safety Professionals Reference and Study Guide", CRC Press, Third Edition, 2020.
- 3. Alan J Stolzer"Safety Management Systems In Aviation" CRC Press, Third Edition ,2023

E-RESOURCES

- 1. https://nptel.ac.in/courses/110105094 (Industrial Safety Engineering)
- https://onlinecourses.nptel.ac.in/noc21_me16/preview-(Inspection and Quality Control In Manufacturing)

Mapping of Cos-Pos & PSOs

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	-	1	2	2	2	1	-	1	2	2	2
2	2	2	2	2	-	1	2	2	2	1	-	1	2	2	2
3	2	2	2	2	-	1	2	2	2	1	-	1	2	2	2
4	2	2	2	2	-	1	2	2	2	1	-	1	2	2	2
5	2	2	2	2	-	1	2	2	2	1	-	1	2	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	2	2	2	-	1	2	2	-	1	-	1	2	2	2





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SEMESTER VII **PROJECT WORK**

23METP01

LTPC 00126

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OBJECTIVES

- To know the various skills to formulate a technical project. •
- To understand the ability to solve specific problem. •
- To study the use of new tools, algorithms and techniques required to carry out the projects. •
- To study the guidance on the various procedures for validation of the product and analyze the costeffectiveness.
- To know the guidelines to prepare technical report of the project.

GUIDELINE FOR REVIEW AND EVALUATION

The students in a group of 3 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

OUTCOMES

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

- Define a real world problem, identify the requirement and develop the design solutions.
- Identify technical ideas, strategies and methodologies. •
- Develop the test and validate through conformance of the developed prototype and analysis the cost effectiveness.
- Adapt technical report and oral presentations.
- Solve any challenging practical problem in the field of engineering and find better solutions to it.

со	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
2	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
3	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
4	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
5	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
6	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
AVG	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2

Mapping of Cos-Pos & PSOs





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DEPARTMENT OF MECHANICAL ENGINEERING

REGULATION - 2023

(Revised)

(III - VII SEMESTERS)

MINOR DEGREE/ HONOURS 3D PRINTING

CURRICULUM AND SYLLABI







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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(MINOR DEGREE / HONOURS - 3D PRINTING)

B.E- MECHANICAL ENGINEERING

Course Code	Name of the Subject	Category	Pe	erioc Nee	ls / k	Credit	Max	imum N	larks
			L	Τ	Ρ	С	CIA	ESE	TOT
THEORY									
23METT01	3D Printing Machines and Systems	PC	3	0	0	3	40	60	100
23METT02	Rapid Tooling and Industrial Applications	PC	3	0	0	3	40	60	100
23METT03	Print Operations Management	PC	3	0	0	3	40	60	100
EMBEDDED	COURSE								
23METE01	3D Printing Design Process	PC	3	0	2	4	50	50	100
EMPLOYAB	LITY ENHANCEMENT COURSE								
23METP01	Project Work	EEC	0	0	12	6	60	40	100
	TOTAL						19		

PC · Professional Core
PC · Professional Core

- EEC **Employability Enhancement Courses** 2
- L Lecture :
- Т Tutorial
- Ρ Practical :
- С • Credit Point
- CIA **Continuous Internal Assessment** :
- ESE End Semester Examination :
- TOT 1 Total





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SEMESTER III

23METT01

3D PRINTING MACHINES AND SYSTEMS

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OBJECTIVES

- To learn the construction of basic 3D Printing machines
- To understand the Energy delivery, Material delivery, Nozzle and Heating Systems
- To know the Optical & Optoelectronic components in 3D Printing
- To study the environmental control systems
- To understand the Pre-processing & Post processing techniques in 3D printing

UNIT I INTRODUCTION TO 3D PRINTING MACHINES & PROCESSES

Introduction to 3D Printing Machines: Historical Perspectives, Rapid Prototyping - An Integral Part of TimeCompression Engineering, RP Information Workflow.

Rapid Prototyping Processes: Classification of Rapid Prototyping Processes, Processes Involving a Liquid - Solidification of a Liquid Polymer

UNIT II RAPID PROTOTYPING SYSTEMS

Stereolithography Apparatus, Solid Ground Curing Systems, Fused Deposition Modelling Systems, Selective Laser Sintering Systems, Laminated Object Manufacturing Systems, Paper Lamination Technology

UNIT III TECHNICAL, TECHNOLOGICAL CAPABILITIES & APPLICATIONS OF RAPID PROTOTYPINGTECHNOLOGY

Technical Characteristics and Technological Capabilities of Concept: Modellers, 3D Sys tems Thermo Jet Printer, Sanders Model Maker II, Stratasys Genisys Xs 3D Printer, JP System,

Applications of Rapid Prototyping Technology: Functional Models, Pattern for Investment and Vacuum Casting, Art Models, Engineering Analysis Models.

UNIT IV INDIRECT & DIRECT METHODS FOR RAPID TOOL PRODUCTION

Indirect Methods for Rapid Tool Production: Role of Indirect Methods in Tool Production, Metal Deposition Tools, Epoxy Tools, Ceramic Tools, Cast Metal Tools, Investment Casting, Fusible Metallic Core, Sand Casting Process.

Direct Methods for Rapid Tool Production: Classification of Direct Rapid Tool Methods, Direct ACESTM Injection Molds, DTM RapidToo1 Process, Sand Form EOS Direct tool Process, , Topographic Shape Formation.

UNIT V APPLICATIONS OF RAPID TOOLING TECHNOLOGY & PROCESS OPTIMISATION 9 RPT Optimization - Factors Influencing Accuracy - Data Preparation, Errors due to Tessellation and Slicing, PartBuilding, Part Building Errors in the SL Process and SLS Process, Part Finishing, Selection of Part Build Orientation, Orientation Constraints of the SL and SLS Process.

TOTAL: 45 PERIODS





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OUTCOMES

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

- Construct the basic 3D printing machines.
- Examine the Energy delivery, Material delivery, Nozzle and Heating Systems.
- Examine the Optical & Optoelectronic components in 3D Printing.
- Analyze the environmental control systems.
- Apply the Pre-processing & Post processing techniques in 3D printing.

TEXT BOOKS

- D.T. Pham, S.S. Dimov, "Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling", Springer Science & Business Media, Second Edition, 2018.
- 2. Clifford T Smyth, "Functional Design for 3D Printing Machines", Third Edition, 2017.
- 3. Rafiq Noorani, "3D Printing Technology, Applications, and Selection", Fourth Edition 2019.

REFERENCES

- 1. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Third Edition, 2018.
- Peter Hilton & Paul Jacobs, "Rapid Tooling: Technologies and Industrial Applications", Second Edition, 2017.
- 3. Paul F. Jacobs, "Rapid Tooling: Technologies and Industrial Applications", Third Edition, 2019.

E-RESOURCES

- 1. https://nptel.ac.in/courses/116102052 (Advanced Textile printing technology)
- 2. https://nptel.ac.in/courses/116102053 (3 D Printing machine)

CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	-	-	2	-	-	-	-	1	3	1	3
2	3	2	2	-	-	-	2	-	-	-	-	1	3	1	3
3	3	2	2	-	-	-	2	-	-	-	-	1	3	1	3
4	3	2	2	-	-	-	2	-	-	-	-	1	3	1	3
5	3	2	2	-	-	-	2	-	-	-	-	1	3	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	2	-	-	-	2	-	-	-	-	1	3	1	3

Mapping of Cos-Pos & PSOs





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SEMESTER IV



23METT02

RAPID TOOLING AND INDUSTRIAL APPLICATIONS

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OBJECTIVES

- To know the suitable rapid tooling technique for rapid product development.
- To learn the suitable tooling method for the given industrial application.
- To study the errors during development of tool and minimize them.
- To study the tool for the given medical application.
- To understand the tool for the given automobile application.

UNIT I BASICS, DEFINITIONS, AND APPLICATION LEVELS

Additive Manufacturing - Layer Manufacturing, Principle of layer-based technology, Application Levels, Indirect processes, Classes of machines for additive manufacturing.

UNIT II LAYER MANUFACTURING PROCESSES

Direct Layer Manufacturing Processes, Polymerization - Laser-Stereolithography, Polymer Printing and Jetting, Digital Light Processing, Micro Stereolithography. Sintering and Melting - Laser Sintering - Laser Melting - Selective Laser Melting (SLM), Electron Beam Melting. Extrusion -Fused Layer Modeling, Powder - Binder Bonding - Three-Dimensional Printing - Z-Corporation, Prometal - LLM

UNIT III APPLICATIONS OF RAPID PROTOTYPE TOOLING

Data Processing and Application Workflow - AM Process Chain, Applications of AM - Automotive Industries and Suppliers. Aerospace Industry, Consumer Goods, Toy Industry, Art and History of Art, Foundry and Casting Technology, Mold and Die Making for Plastic Injection Molding and Metal Die Casting, Medical, Architectureand Landscaping.

UNIT IV ADDITIVE MANUFACTURING DESIGN AND STRATEGIES

Potential of AM, Potentials and Resulting Perspectives - Complex Geometries, Integrated Geometry, Integrated Functionalities, Multi-Material Parts and Graded Materials. AM-Based New Strategies – Customization.

UNIT V MATERIALS, DESIGN, AND QUALITY ASPECTS FOR ADDITIVE MANUFACTURING 9 Materials for AM - Anisotropic and Isentropic properties material, Graded and Composite Materials. EngineeringDesign Rules for AM - Tolerances – Digital to Object, Relative Fit, Flexures, Hinges, and Snap-Fits, Orientation and Clamping, Drillings (Bores), Gaps, Pins, and Walls. AM Properties, Selection, Build Management

TOTAL: 45 PERIODS





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OUTCOMES

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

- Apply appropriate rapid tooling techniques for efficient product development.
- Examine a suitable tooling methods for specified industrial applications..
- Analyze the errors during development of tool and minimize them.
- Analyze the tool for the given medical application
- Examine the tool for the given automobile application

TEXT BOOKS

- 1. Andreas Gebhardt, "Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture", Third Edition, 2018.
- 2. Kaushik Kumar, Divya Jindani," Rapid prototyping and tooling", Second Edition, 2020.
- 3. Ali K. Kamrani, Emad Abouel Nasr, "Rapid Prototyping : Theory and Practice", Second Edition, 2020.

REFERENCES

- 1. Chee Kai Chua, Kah Fai Leong, Chu Sing Lim, "Rapid Prototyping: Principles and Applications", Second Edition, 2018.
- 2. D.T. Pham and S.S Dimov, Rapid Manufacturing: The Technologies and Applications of RapidPrototyping & Rapid Tooling, Springer, 2019.
- 3. Wanlong Wang, Henry W. Stoll and James G. Conley, Rapid Tooling Guidelines for SandCasting, Springer, 2017.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112104265 (Rapid Manufacturing)
- 2. https://archive.nptel.ac.in/courses/112/104/112104265/ (Rapid Manufacturing process)

СО	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	-	-	2	1	-	-	-	-	-	3	1	2
2	2	3	2	-	-	2	1	-	-	-	-	-	3	1	2
3	2	3	2	-	-	2	1	-	-	-	-	-	3	1	2
4	2	3	2	-	-	2	1	-	-	-	-	-	3	1	2
5	2	3	2	-	-	2	1	-	-	-	-	-	3	1	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	3	2	-	-	2	1	-	-	-	-	-	3	1	2

Mapping of Cos-Pos & PSOs



SEC - UG - R2023 / JUNE - 2024 (REVISED)



Page 155

GUNTHA

ESTD 2001

SEMESTER V PRINT OPERATIONS MANAGEMENT

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23METT03

OBJECTIVES

- To understand the basic concepts of print operations. •
- To understand the concepts of Scheduling and its importance in the printing Industry.
- To acquire knowledge of the various applications of inventory and project • management withrespect to the Printing Industry.
- To study a materials & capacity requirement planning.
- To learn design network models in print operations.

UNIT I INTRODUCTION

Organization Structure - Sole Proprietor, Partnership, Limited Company, Administrative office routine, Forms used, Processing orders; Facility location decision making - Economic analysis -Qualitative factor Analysis - Layout of the factory - Analysis & selection; Human Factors -Consideration of man & machine job-design, Ergonomics - Working environment - Worker safety.

UNIT II SEQUENCING

Gantt chart, Algorithms for solving sequencing problems - Processing of N jobs through 2 machines, n jobs through 3 and K machines, Assignments and transportation algorithms

UNIT III INVENTORY MANAGEMENT

Definition & purpose, Inventory classification, EOQ, Materials handling and Warehousing.

UNIT IV MATERIALS & CAPACITY REQUIREMENT PLANNING

MRP, CRP - Concepts & applications, Aggregate planning & Master Scheduling, ERP - Concepts and systems.

UNIT V NETWORK MODELS

Introduction, PERT and CPM models, Network construction, Problems, Resource analysis and allocation, Replacement analysis, Application & case studies.

TOTAL: 45 PERIODS

OUTCOMES

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

- Discuss the working of printing organization. •
- Apply various management concepts in managing a print establishment. •
- Analyze the print operations management concepts to solve management problems.
- Summarize the materials and capacity requirement planning.
- Illustrate about various network models. .







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TEXT BOOKS

- 1. N.D.Vohra, "Quantitative techniques in management", Tata McGraw Hill Publishing Co. Ltd., 2017.
- 2. Joseph G.Monks, "Operations Management Theory and Problems", McGraw Hill InternationalLtd., 2016.
- 3. Chase, R.B., Ravi Shankar & Jacobs, F.R. Operations & Supply Management. Fifteenth Edition, McGraw Hill

REFERENCES

- 1. U.K.Srivastava, G.V.Shenory & S.C.Sharma, "Quantitative techniques for Managerial decisions", New Age international (P) Ltd., Publishers - Formerly Wiley Eastern Ltd., Third Edition 2016.
- 2. Ravi Anupindi, Sunil Chopra, Managing Business Process Flows: Principles of Operations Management, Pearson, Fourth Edition 2015
- 3. Slack N, Chambers S, Johnston R, "Operations management", Prentice Hall, Third Edition 2016

E-RESOURCES

- 1. https://www.digimat.in/nptel/courses/video/110106045/L34.html (Operation and supply chainmanagement)
- 2. https://archive.nptel.ac.in/courses/112/103/112103306/ (Fundamental of Additive manufacturing Technology)

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	2	-	-	-	1	-	-	1	2	1	3
2	3	2	2	1	2	-	-	-	1	-	-	1	2	1	3
3	3	2	2	1	2	-	-	-	1	-	-	1	2	1	3
4	3	2	2	1	2	-	-	-	1	-	-	1	2	1	3
5	3	2	2	1	2	-	-	-	1	-	-	1	2	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	2	1	2	-	-	-	1	-	-	1	2	1	3

Mapping of Cos-Pos & PSOs





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SEMESTER VI

3D PRINTING DESIGN PROCESS LT P C

(Lab Embedded Theory Course)

OBJECTIVES

23METE01

- To know the importance of 3D printing in Manufacturing.
- To know the different 3D Printing Technologies.
- To learn a suitable material for 3D Printing.
- To understand the different methods for Post-processing of 3D Printing parts.
- To understand the applications of 3D Printing in Automobile, Aerospace, Bio-medical etc. •
- To acquire a practical experience in handling 3D printing software systems.

UNIT I INTRODUCTION AND BASIC PRINCIPLES

3D Printing, Generic 3D Printing Process, Benefits of 3D Printing, Distinction between 3D Printing and CNC Machining, Other Related Technologies

Development of 3D Printing Technology: Introduction, Computers, Computer-Aided Design Technology, Other Associated Technologies, The Use of Layers, Classification of 3D Printing Processes, Metal and Hybrid Systems.

UNIT II 3D PRINTING PROCESS CHAIN & PHOTO POLYMERIZATION PROCESSES 9

Eight Steps in Additive Manufacture, Variations from One 3D Printing Machine to Another, Metal Systems, Maintenance of Equipment, Materials Handling Issues, Design for 3D Printing.

Introduction to Photo polymerization Processes: Photo polymerization Materials, Reaction Rates, Vector Scan SL, SL Resin Curing Process, SL Scan Patterns, Vector Scan Micro stereo lithography, Mask Projection Photo polymerization technologies and processes.

UNIT III **POWDER BED FUSION PROCESSES & EXTRUSION-BASED SYSTEMS** 9

Powder Bed Fusion Processes: Introduction, SLS Process Description, Powder Handling, Approaches to Metal and Ceric Part Creation, Variants of Powder Bed Fusion Processes, Process Par 3D Printing, Applied Energy Correlations and Scan Patterns, Typical Materials and Applications, Materials - Capabilities and Limitations.

Extrusion - Based Systems: Introduction, Basic Principles, Plotting and Path Control, Materials, Limitations of FDM, Bio extrusion, Other Systems.





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UNIT IV DESIGN, GUIDELINES FOR PROCESS SELECTION & SOFTWARE ISSUES 9

Design for 3D Printing - Design for Manufacturing and Assembly, Core DFM for 3D Printing Concepts and Objectives, 3D Printing Unique Capabilities, Exploring Design Freedoms, Design Tools for 3D Printing. Guidelines for Process Selection - Selection Methods for a Part, Challenges of Selection, Preliminary

Selection, Production Planning and Control. Software Issues for 3D Printing - Preparation of CAD Models - the STL File, Problems with STL Files, STL File Manipulation, Beyond the STL File, Additional Software to Assist 3D Printing.

UNIT V MEDICAL APPLICATIONS & FUTURE DIRECTIONS FOR 3D PRINTING 9

Medical Applications for 3D Printing - Use of 3D Printing to Support Medical Applications, Software Support for Medical Applications, Limitations and Further Development of Medical 3D Printing Applications. Use of Multiple Materials in 3D Printing - Discrete, Porous and Blended Multiple Material Processes, Embedded Component 3D Printing, Commercial Applications Using Multiple Materials

LIST OF EXPERIMENTS

- 1. 3D printing of Shaft Support
- 2. 3D printing of Spur Gear
- 3. 3D printing of Helical Gear
- 4. 3D printing of lock nut
- 5. 3D printing of ratchet
- 6. 3D printing of Cam
- 7. 3D printing of sprocket gear with holes

OUTCOMES

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

- Explain the importance of 3D printing in manufacturing.
- Compare different 3D printing technologies.
- Select suitable materials for 3D printing.
- Apply different methods for post-processing of 3D printed parts.
- Analyze the applications of 3D printing in various fields such as automobile, aerospace and biomedical industries.
- Demonstrate 3D printing models using software.





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TEXT BOOKS

- 1. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, Third Edition 2015
- 2. 3D Printing Technology and Applications, Rafiq Noorani, Fifth September 2017
- 3. Mastering 3D Printing, Joan Horvath, Second Edition, 2015

REFERENCES

- 1. Chua Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, Second Edition 2015.
- 2. Ali K. Kamrani, Emand Abouel Nasr, "Rapid Prototyping: Theory & Practice", Springer, Third Edition 2016.
- 3. D.T. Pham, S.S. Dimov, Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, Springer, Second Edition 2015.

E-RESOURCES

- 1. https://nptel.ac.in/courses/112103306 (Manufacturing Process and technology)
- 2. https://elearn.nptel.ac.in/shop/iit-workshops/ongoing/additive-manufacturing-technologiesfor-practicing-engineers/ (Additive Manufacturing Technologies for Practicing Engineers)

со	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	-	-	-	1	-	-	1	3	3	2
2	3	2	2	2	2	-	-	-	1	-	-	1	3	3	2
3	3	2	2	2	2	-	-	-	1	-	-	1	3	3	2
4	3	2	2	2	2	-	-	-	1	-	-	1	3	3	2
5	3	2	2	2	2	-	-	-	1	-	-	1	3	3	2
6	3	2	2	2	2	-	-	-	1	-	-	1	3	3	2
AVG	3	2	2	2	2	-	-	-	1	-	-	1	3	3	2

Mapping of Cos-Pos & PSOs





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

SEMESTER VII PROJECT WORK

23METP01

L T P C 0 0 12 6

OBJECTIVES

- To know the various skills to formulate a technical project.
- To understand the ability to solve specific problem.
- To study the use of new tools, algorithms and techniques required to carry out the projects.
- To study the guidance on the various procedures for validation of the product and analyze the costeffectiveness.
- To know the guidelines to prepare technical report of the project.

GUIDELINE FOR REVIEW AND EVALUATION

The students in a group of 3 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

OUTCOMES

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

- Define a real world problem, identify the requirement and develop the design solutions.
- Identify technical ideas, strategies and methodologies.
- Develop the test and validate through conformance of the developed prototype and analysis the cost effectiveness.
- Adapt technical report and oral presentations.
- Solve any challenging practical problem in the field of engineering and find better solutions to it.

CO	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
2	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
3	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
4	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
5	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
6	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2
AVG	3	2	2	2	2	-	-	1	-	1	-	1	3	3	2

Mapping of Cos-Pos & PSOs





SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS) (Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai) Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956 NAAC Accredited with 'A' Grade TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



CREDIT SUMMARY

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(MINOR DEGREE / HONOURS - INDUSTRIAL SAFETY ENGINEERING / 3D PRINTING)

Cotogony	Credits Per Semester										
Category	I	II	III	IV	V	VI	VII	VIII	Total		
HS	-	-	-	-	-	-	-	-	-		
BS	-	-	-	-	-	-	-	-	-		
ES	-	-	-	-	-	-	-	-	-		
PC	-	-	3	3	3	4	-	-	13		
PE	-	-	-	-	-	-	-	-	-		
OE	-	-	-	-	-	-	-	-	-		
EEC	-	-	-	-	-	-	6	-	6		
MC	-	-	-	-	-	-	-	-	-		
Total	-	-	3	3	3	4	6	-	19		

B.E. MECHANICAL ENGINEERING

