SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

SRM Nagar, Kattankulathur - 603 203.

(Approved by AICTE, Affiliated to Anna University, 'A' Grade Accredited by NAAC, NBA Accredited, ISO 9001: 2015 Certified)

CURRICULA AND SYLLABI

B.E.– MECHANICAL ENGINEERING

REGULATION 2023

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. MECHANICAL ENGINEERING

REGULATIONS – 2023

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

1. To prepare our students for successful careers as employees or employers in addition to pursuing higher education.
2. To prepare our students with fundamental knowledge in Mechanical Engineering in order to understand, analyze, design and create products.
3. To develop our students to have an advanced, deep and wide knowledge of multidisciplinary fields
4. To prepare our students to be ethical professionals and create interest in lifelong learning through self-study.

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, our Mechanical Engineering Graduates will exhibit ability to:

PO#	Graduate Attribute	Programme Outcomes
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

3. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Mechanical Engineering program the student will have following Program specific outcomes

PSO1: Ability to analyze and solve problems related to mechanical engineering.

PSO2: Can be able to apply thermal, fluid, design, electrical & electronics Engineering principles to mechanical engineering applications.

PSO3: Would be able to apply the tools and techniques of quality management of Manufacturing service processes.

PSO4: Ability to use the concept of process planning and cost estimation to Manufacture different products.

4. PEO / PO Mapping:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
I	3	3	3	3	3	2			2		1			3		
II							3	3	2	3	1			3	3	
III	3	3		3	3	2				3	1	1			3	
IV		3	3	3	3				2	3	1					3

Contribution: 1- Reasonable; 2-Significant; 3- Strong

		Subject code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Year I	Sem I	EN3111- Professional English – I	2.2	1.6	1	1.2	0.4	-	1	-	-	2.8	0.2	0.4	-	-	-	-
		MA3122- Matrices and Calculus	3	2	2	1								1				
		PH3123- Engineering Physics	2.8	1.4	1.4	1	1.25	1	1					1				
		CH3124- Engineering Chemistry	2.8	1.8	2.2	1.2	0.2	0.2	0.8	-	-	-	-	0.8	1	-	-	-
		GE3131- Basic Electrical & Electronics Engineering	2.8	2.8	1.7	1.6	3	2	2	2					1.8	1.5	2.5	2
		GE3111- தமிழர் மரபு /Heritage of Tamil																
		GE3121 -Physics and Chemistry Laboratory	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-	-	-
		GE3134- Engineering Practices Laboratory	0.6	2	1.4	1.2	1.2	0.2			0.2		0.2	0.4	0.6		1	0.4
		EN3119- English Language Learning Laboratory I	1	1	0.4	0.8	0.4		0.8			2.2		1				
Year I	Sem II	EN3211- Professional English – II	1.2	1.2	1.4	1.2	0.4					2.8	0.2	0.4				
		MA3222- Statistics and Numerical Methods	3	3											3			
		PH3225- Materials Science	2.6	2	1.3	1.2	1	1	1	-	-	-	-	1	-	-	-	-
		CH3225- Chemistry of Functional Materials	2.8	2.2	1.4	2	1.4	-	0.2	-	-	-	-	1	0.8	1.2	-	-
		GE3231- Problem solving and Python Programming	2.4	2.6	3	2.8	1.8						1.6	2	2.5		2	1
		GE3211- தமிழரும் தொழில்நுட்பமும்/ Tamil and Technology																
		GE3233- Engineering Graphics and Design	2		3		1				1	3		2	2	1	1	1

		GE3221- Engineering Sciences Laboratory	**3**	**2.4**	**2.6**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		GE3232- Problem solving and Python Programming Laboratory	**2.6**	**2.6**	**3.0**	**2.8**	**2.2**						**2.0**	**2.0**	**1.0**	**3.0**	**1.7**	**2.0**
		GE3251- NSS//YRC/NSO/ACTIVITES																

			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Year II	Sem III	MA3321- Transforms And Partial Differential Equations	3	3			1							1				
		ME3332- Engineering Mechanics	3	3	3	3									3	3		
		ME3363-Engineering Thermodynamics	3	3	2	1		0.4			1		0.6	2	1.8	0.8	1.2	
		ME3364-Engineering Metallurgy And Material Testing	3	1	3	1	0.4	0.4	0.4	0.2				2	2	1	2	
		ME3365-Manufacturing Processes	3		2		2	2	2	1	1			1	3	1	2	
		ME3336-Fluid Mechanics and Machinery	3	2.8	3	0.6	1.6	0.4							3	3		
		ME3367-Manufacturing Technology Laboratory-I	3						1		2			1	1	2	2	
		ME3338- Fluid Mechanics and Machinery Laboratory	3.2	3.2	3.2	3.2	3.2	3.2	3		3.2	3.2			1.6	2	2	2
		ME3339- Computer Aided Drafting Laboratory	1.3		1.3	0.3	1	1.3			1.3	1			1.3	1	0.3	0.3
Year II	Sem IV	MA3425- Applied Mathematics for Mechanical Engineering	2	2	1	1												
		ME3462- Manufacturing Technology	3	3	2.8	1	1	1	3			3		2	3	2.2	2.2	
		ME3463-Strength of Materials	3	3	3	3	2	3	1	3			1	3	3	2	3	
		ME3464-Theory of Machines	3	2	2		2			1				1	3		1	
		ME3465-Unconventional Machining Processes	3	2	2		3	3	1						2.2	2.2	2.2	
		ME3466-Thermal Engineering	2	2										2	2	1		
		ME3451-NCC Credit																

		Course Level – I																
		ME3467-Manufacturing Technology Laboratory-II	**3**						**1**		**2**			**1**	**1**	**2**	**2**	
		ME3468-Strength of Materials Laboratory	**3**	**2**	**1.2**	**3**	**2.8**	**1**	**1**		**3**			**1**	**2.6**	**2**	**3**	**2**
		ME3469-Thermal Engineering Laboratory	**3**	**3**		**3**		**2**	**2**	**1**					**3**	**3**		

SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

B.E. MECHANICAL ENGINEERING

CURRICULUM FOR SEMESTERS I TO IV

Semester - I								
S.No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	**EN3111**	Professional English – I	HSMC	3	3	0	0	3
2	**MA3122**	Matrices and Calculus	BSC	4	3	1	0	4
3	**PH3123**	Engineering Physics	BSC	3	3	0	0	3
4	**CH3124**	Engineering Chemistry	BSC	3	3	0	0	3
5	**GE3131**	Basic Electrical and Electronics Engineering	ESC	3	3	0	0	3
6	**GE3111**	தமிழர் மரபு / Heritage of Tamils	HSMC	1	1	0	0	1
PRACTICAL								
9	**EN3119**	English Language Learning Laboratory I	EEC	2	0	0	2	1
7	**GE3121**	Physics and Chemistry Laboratory	BSC	4	0	0	4	2
8	**GE3134**	Engineering Practices Laboratory	ESC	4	0	0	4	2
			TOTAL	**27**	**16**	**1**	**10**	**22**
Semester - II								
S.No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	**EN3211**	Professional English – II	HSMC	3	3	0	0	3
2	**MA3222**	Statistics and Numerical Methods	BSC	4	3	1	0	4
3	**PH3225**	Materials Science	BSC	3	3	0	0	3
4	**CH3225**	Chemistry of Functional Materials	BSC	3	3	0	0	3
5	**GE3231**	Problem solving and Python Programming	ESC	3	3	0	0	3
6	**GE3211**	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	HSMC	1	1	0	0	1
THEORY CUM PRACTICAL								
7	**GE3233**	Engineering Graphics and Design	BSC	5	1	0	4	3
PRACTICAL								
8	**GE3228**	Engineering Sciences Laboratory	ESC	4	0	0	4	2
9	**GE3232**	Problem solving and Python Programming Laboratory	ESC	4	0	0	4	2
10	**GE3251**	NSS/YRC/NSO/Activities#	PCD	1#	0	0	0	1#
			TOTAL	**31**	**17**	**1**	**12**	**24**

Conducted after college hours

Semester - III								
S.No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	**MA3321**	Transforms and Partial Differential Equations	BSC	3	3	0	0	3
2	**ME3332**	Engineering Mechanics	ESC	3	3	0	0	3
3	**ME3363**	Engineering Thermodynamics	PCC	3	3	0	0	3
4	**ME3364**	Engineering Metallurgy and Material Testing	PCC	3	3	0	0	3
5	**ME3365**	Manufacturing Processes	PCC	3	3	0	0	3
6	**ME3336**	Fluid Mechanics and Machinery	ESC	3	3	0	0	3
PRACTICAL								
7	**ME3367**	Manufacturing Technology Laboratory-I	PCC	3	0	0	3	2
8	**ME3338**	Fluid Mechanics and Machinery Laboratory	ESC	3	0	0	3	1.5
9	**ME3339**	Computer Aided Drafting Laboratory	ESC	3	0	0	3	1.5
			TOTAL	**27**	**18**	**0**	**9**	**23**

Semester - IV								
S.No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY								
1	**MA3425**	Applied Mathematics for Mechanical Engineering	BSC	2	2	0	0	2
2	**ME3462**	Manufacturing Technology	PCC	3	3	0	0	3
3	**ME3463**	Strength of Materials	PCC	3	3	0	0	3
4	**ME3464**	Theory of Machines	PCC	3	3	0	0	3
5	**ME3465**	Unconventional Machining Processes	PCC	3	3	0	0	3
6	**ME3466**	Thermal Engineering	PCC	3	3	0	0	3
7	**GE3451**	NCC Credit Course Level - I	PCD	3#	3#	0	0	3#
PRACTICAL								
8	**ME3467**	Manufacturing Technology Laboratory-II	PCC	3	0	0	3	2
9	**ME3468**	Strength of Materials Laboratory	PCC	3	0	0	3	1.5
10	**ME3469**	Thermal Engineering Laboratory	PCC	3	0	0	3	1.5
			TOTAL	**27**	**17**	**0**	**10**	**22**

 # NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SUMMARY

SL. NO.	Subject area	Credits per semester								Total Credit
		I	II	III	IV	V	VI	VII	VIII	
1.	HSMC	4	4	-	-	-	2	2	-	12
2.	BSC	12	12	3	-	-	-	-	-	27
3.	ESC	5	8	9	-	2	-	-	-	24
4.	PCC	-	-	11	20	16.5	12.5	7.5	-	67.5
5.	PEC	-	-	-	-	6	6	6	-	18
6.	OEC	-	-	-	-	-	-	3	-	3
7.	EEC	1	-	-	-	-	1	2.5	10	14.5
8.	PCD	-	-	-	-	-	-	-	-	-
	Mandatory Course(Non-credit)									
	Total	22	24	23	20.5	24.5	21	21	10	166

Enrollment for B.E. / B. Tech. (Honours) / Minor degree (Optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E./B.Tech. (Honours) Minor degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses

(18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

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

Complete details are available in clause 4.10 of Regulations 2023.

EN3111	EN3111 PROFESSIONAL ENGLISH – I	L	T	P	C
		3	1	0	3

OBJECTIVES:

1. To upgrade the English language skills of students by introducing communication techniques, speaking and grammar learning activities which are relevant to authentic contexts.
2. To improve the basic reading and writing skills of the learners.
3. To enhance the communicative competence of the first-year engineering students.
4. To enable learners to use language effectively in academic/work contexts.
5. To help learners understand content- context in relevant situations

UNIT-I: INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 9

Listening: Podcast watching – Listening for new words and pronunciation.
Speaking: Note of appreciation for classmates /family member – formal appreciation of someone, expression of feelings.
Reading: Books, shorts stories to be read. Filling forms (i.e.) post office or bank.
Writing: Film and **series** Review / Book Review, Email and Informal letters.
Language and Vocabulary development: WH questions, Yes/No questions, Single Word Substitutes, Pronouns, Parts of Speech, Question tags, Prefixes and Suffixes.

UNIT-II: NARRATION AND SUMMATION 9

Listening: Books – Short Stories to be read aloud in class for listening purpose.
Speaking: Short stories to be read and narrated in the class.
Reading: Reading favourite blogs on Travel, Sports and Food and expressing opinions regarding the same.
Writing: Paragraph writing, Report – field trip / I.V., Autobiography and Comprehension.
Language and Vocabulary development: Tenses – Past, Antonyms, Synonyms, Subject Verb agreement and Prepositions

UNIT-III: DESCRIPTION OF A PROCESS/PRODUCT 9

Listening: Listening to snippets from celebrities/ National leaders' lives.
Speaking: Narrating personal experiences/ events – Expression of emotions and feelings.
Reading: Reading short biographies – famous people and description of the same.
Writing: Instruction, Product / Process description and Advertisements (classified advertisement and display advertisement)
Language and Vocabulary development: Adjectives- Degrees of Comparison, Tenses – Present, Compound Nouns, Homonyms, Homophones and Discourse markers – connective and sequence words

UNIT-IV: CLASSIFICATION AND INTERPRETATION 9

Listening: Listening to Ted Talks.

Speaking: Recreating a Ted talk session in the class.
Reading: Newspaper Reading (Editorial) and understanding.
Writing: Note making, Blogging, Interpretation of charts and graphs.
Language and Vocabulary development: Articles, Collocations and Phrasal Verbs

UNIT – V: EXPRESSION OF THOUGHTS AND IDEAS 9

Listening: Listening to audio books and answering questions.
Speaking: Presentation on a non-technical topic.
Reading: Editorials from newspaper.
Writing: Essay writing – Descriptive and Narrative essays.
Language and Vocabulary development: Tenses – future, Negative statements and questions, Punctuations, Cause and Effect, Content and Function words.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

1: To strengthen the basics of grammar.
2: To narrate informal and informal situations.
3: To describe a process/product and express opinion.
4: To interpret and analyse the content/information given.
5: To write short essays, personal letters and emails in English.

TEXTBOOKS:

1. English for Science and Technology Cambridge University Press,2021. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deep Mary Francis, Dr.K.N.Shoba and Dr.Lourdes Joevani, Department of English, Anna University.
2. Technical Communication – Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford Univ.Press, 2016, New Delhi.

REFERENCE BOOKS:

1. Effective Communication Skill, Kulbhusan Kumar, R.S.Salaria, Khanna Publishing House.
2. Wings of Fire - An Autobiography by A.P.J Abdul Kalam with Arun Tiwari, Sangam Books Ltd , Edition: 50, 1999
3. World's Most Popular Short Stories Saki Maupassant, Anton Chekhov, O Henry Paperback
4. Professional Speaking skills, Aruna Koneru, Oxford University Press.
5. English For Engineers and Technologists, Orient Blackswan Private Ltd. Department of English,Anna University,2020.

CO - PO and CO - PSO MAPPING

EN3111	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	2	2	-	-	-	-	3	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	3	1	1	-	-	-	-
CO3	2	-	2	2	-	-	-	-	-	3	-	1	-	-	-	-
CO4	3	3	-	2	-	-	2	-	-	3	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Average	**2.2**	**1.6**	**1**	**1.2**	**0.4**	**-**	**1**	**-**	**-**	**2.8**	**0.2**	**0.4**	**-**	**-**	**-**	**-**

MA3122 MATRICES AND CALCULUS L T P C

3 1 0 4

OBJECTIVES:

1. To understand and apply matrix techniques for engineering applications.
2. To familiarize the student with basic calculus and traditions of traditional calculus.
3. To solve the problems in single and multivariable calculus and plays an important role in science, economics, engineering.
4. Vector calculus can be widely used for modeling the various laws of physics.
5. To familiarize the student with multiple integrals and their usage in find the area and volume of two and three dimensional objects.

UNIT-I: MATRICES 9L+3T

Eigen values and Eigen vectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigen vectors - Statement and Applications of Cayley-Hamilton Theorem - Reduction of a quadratic form into canonical form by orthogonal transformation.

UNIT-II: DIFFERENTIAL CALCULUS OF ONE VARIABLE 9L+3T

Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Rolle's Theorem and Mean Value theorem -Taylor's series- Maxima and Minima of functions of one variable.

UNIT-III: DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 9L+3T

Partial derivatives - Total derivatives - Jacobians and properties - Taylor's series for functions of two variables - Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT-IV: MULTIPLE INTEGRALS 9L+3T

Double integrals in Cartesian and polar coordinates - Change of order of integration - Area enclosed by plane curves - Change of variables in Polar coordinates - Triple integrals - Volume of solids.

UNIT-V: VECTOR CALCULUS 9L+3T

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Vector Integration Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

TOTAL: 45L +15T PERIODS

OUTCOMES:

1. To apply the idea of reducing complex problems into simple form using matrix technique.
2. Basic application of calculus in engineering problems and to tackle for different geometries.
3. This course equips the students to have basic knowledge and understanding the Partial derivatives and maxima and minima by Lagrange's method.
4. Basic application of Double and Triple integrals used in Engineering real life problems
5. To study the vector differentiation and vector integration by using standard theorems.

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.3. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", S.Chand Private Ltd.,11th Edition, 2005.
2. Veerarajan.T, "Engineering Mathematics", McGrawHill Education(India) Private Ltd 2019.

REFERENCE BOOKS:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt. Ltd., 2011.
2. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015.
3. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics", Volume I, Second Edition, Pearson Publishing, 2017.
4. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

CO - PO and CO - PSO MAPPING

MA3122	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO2	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO3	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO4	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
CO5	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
Average	**3**	**2**	**2**	**1**								**1**				

(1–LOW, 2– MEDIUM, 3–HIGH)

PH3123	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

1. To enhance the fundamental knowledge in crystalline materials and its applications.
2. To explore the knowledge in the production of ultrasonic waves and application in the engineering field.
3. To familiarize the basics of laser and their technical advances in scientific, industrial and health care areas.
4. To understand the principle of fibre optical fibre and its applications.
5. To explore basic concept of quantum and dual nature of particle.

UNIT-I: PROPERTIES OF MATERIALS 9

Elasticity - Hooke's law - Stress-strain diagram and its uses - Poisson ratio - factors affecting elastic modulus and tensile strength.

Single crystalline, polycrystalline and amorphous materials - unit cell - space lattice - crystal systems - Bravais lattice - Miller indices - d-spacing - characteristics of unit cell - SC, BCC, FCC and HCP structure - - thermal and mechanical properties of materials - crystal growth techniques - Czochralski and Bridgmann.

UNIT-II: ULTRASONICS 9

Introduction - Properties - Production: Magnetostriction method **and** Piezoelectric method **-** Acoustical grating **-** determination of ultrasonic velocity in liquid - Application: Detection of flaw in materials (Non Destructive Testing) - ultrasonic soldering, welding - SONAR - diagnostic sonography - cars' air bag sensor-dispersion of fog - Probe sonication for 2D material formation.

UNIT-III: LASERS AND ITS APPLICATIONS 9

Basic concepts and characteristics - Einstein's A and B coefficients (derivation) - population inversion - Pumping methods - Nd-YAG laser - CO_2 laser - Semiconductor lasers: homo junction and heterojunction - applications: laser welding, laser cutting, laser cooling, pattern formation by laser etching, laser bar code scanner - LIDAR - Laser tissue interaction, laser surgery - Holography - NLO - electro-optic effect

UNIT-IV: FIBRE OPTICS 9

Structure and principle - Propagation of light through optical fibre - acceptance angle, numerical aperture - fractional index change - Types of optical fibres (material, mode and refractive index) - Attenuation: absorption, scattering and bending - Dispersion - Fibre optic communication system (Block diagram) and advantages over conventional methods - fibre optic sensors: pressure and displacement- Endoscope.

UNIT – V: QUANTUM PHYSICS 9

Black body radiation and energy distribution spectrum - Planck's theory of radiation - matter waves - de-Broglie wavelength in terms of energy, voltage and temperature - Electron diffraction - G.P.Thomson experiment - wave function and its physical significance - Schrödinger's wave equation - time independent and time dependent equations - Particle in a one-dimensional box- Normalization of wave function - Quantum Tunnelling - Scanning Tunnelling Microscope.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able

1. To understand the properties of materials, crystalline material and growth techniques.
2. To understand the basics, generation and application of ultrasonics.
3. To acquire knowledge on the concepts of lasers and their applications in industry and medical field.
4. To conversant on principle behind the fibres and their applications in communication and devices made out of optical fibre.
5. To get knowledge on advanced physics concepts of quantum theory and its applications.

TEXTBOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

4. Brijlal and Subramanyam, “Properties of Matter”, S .Chand publishing, 2002.
5. M.N.Avadhanulu & P.G.Kshirasagar, “A Text Book of Engineering Physics” – IX Edition, S.Chand Publications, 2014.
6. V.Rajendiran, Engineering Physics, Tata McGraw-Hill, New Delhi. 2011.

REFERENCE BOOKS:

1. Halliday, D., Resnick, R. & Walker, J. “Principles of Physics”. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. “Physics for Scientists and Engineers”. Cengage Learning, 2010.
3. Shatendra Sharma & Jyotsna Sharma, “Engineering Physics”. Pearson, 2018

CO - PO and CO - PSO MAPPING

PH3123	PROGRAM OUTCOMES												PSO’s			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	1	1			1	1					1				
CO2	3	1	1	1	2	1	1					1				
CO3	3	2	2	1	1	1	1					1				
CO4	3	2	2	1	1	1	1					1				
CO5	2	1	1	1	1	1	1					1				
Average	**2.8**	**1.4**	**1.4**	**1**	**1.25**	**1**	**1**					**1**				

(1-LOW, 2-MEDIUM, 3-HIGH)

CH3124	ENGINEERING CHEMISTRY	L	T	P	C
	(First Semester-Common to all branches)	3	0	0	3

OBJECTIVES:

1. To make the students familiar with boiler feed water requirements, related problems and domestic water treatment techniques.
2. To introduce the basic concepts and applications of chemical thermodynamics.
3. To acquaint the student with the principles of chemical kinetics and its applications towards engineering.
4. To make the student conversant with the basics of surface chemistry and catalysis.
5. To inculcate the students with the basics principles and preparatory methods of nano materials.

UNIT-I: WATER TECHNOLOGY 9

Introduction-sources of water-impurities present in water-hard water and hardness - types, Municipal water treatment: primary treatment and disinfection - Desalination of brackish water: Reverse Osmosis, Boiler troubles: scale and sludge, caustic embrittlement, boiler corrosion priming and foaming, Treatment of boiler feed water - Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning). External treatment: Ion exchange process, cooling waters (Langelier index).

UNIT-II: CHEMICAL THERMODYNAMICS 9

Introduction-terminology of thermodynamics, the first law of thermodynamics: enthalpy, second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions: Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions, Criteria of spontaneity; Gibbs-Helmholtz equation, Clausius-Clapeyron equation, Maxwell relations, Van't Hoff isotherm and isochore.

UNIT-III: CHEMICAL KINETICS 9

Introduction-factors influencing the rate of reaction, order and molecularity of a reaction, kinetic equations of different orders (first, second and third order) - determination of the order of a reaction, the temperature dependence of reaction rates, unimolecular reactions, photochemical reactions and chain reactions, Theories of reaction rates, lasers in chemistry, fast reactions.

UNIT-IV: SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: classification - adsorption of gases on solids - adsorption from solutions - adsorption isotherms - applications of adsorption - Freundlich's adsorption isotherm - Langmuir's adsorption isotherm, B.E.T isotherm. Catalysis: introduction - types of catalysis - criteria - autocatalysis - catalytic poisoning and catalytic promoters - acid -base catalysis - enzyme catalysis - Michaelis - Menten equation

UNIT – V: NANOCHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties; Types of nanomaterials: Definition, properties and uses of - nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electrospinning. Applications of nanomaterials in medicine, agriculture, food science and energy resources.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able

1. To infer the quality of water from quality parameter data and propose suitable treatment.
2. To apply the knowledge of chemical thermodynamics for material design and aspects
3. To recommend the proper chemical kinetics for engineering processes and applications.
4. To recognize the surface morphology and its engineering applications.
5. To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.

TEXTBOOKS:

1. Payal B. Joshi and Shashank Deep, "Engineering Chemistry", Oxford University Press, New Delhi, 2019.
2. Shikha Agarwal, "Engineering Chemistry"-Fundamentals and Applications, 2nd Edition, Cambridge University Press, New Delhi, 2019.
3. P. C. Jain and Monica Jain, "Engineering Chemistry", 18th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2021.

REFERENCE BOOKS:

1. R. V. Gadag and A. Nithyananda Shetty, “Engineering Chemistry”, 3rd Edition, Wiley & I.K. International (P), LTD, New Delhi, 2019.
2. S.S. Dara and S.S. Umare, “A Text Book of Engineering Chemistry”, 12th Edition, S. Chand & Company LTD, New Delhi, 2018.
3. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Publishing Company LTD, 2023.

CO - PO and CO - PSO MAPPING

	PROGRAM OUTCOMES												**PSO’s**			
CH3124	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	3	2	-	1	3	-	-	-	-	2	1	-	-	-
CO2	3	1	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	2	2	3	2	1	-	1	-	-	-	-	2	1	-	-	-
Average	**2.8**	**1.8**	**2.2**	**1.2**	**0.2**	**0.2**	**0.8**	**-**	**-**	**-**	**-**	**0.8**	**1**	-	-	-

(1–LOW, 2– MEDIUM, 3–HIGH)

G**E3131**	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES

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

UNIT-I ELECTRICAL CIRCUITS 9

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

UNIT-II ELECTRICAL MACHINES 9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, working principle and Applications of Transformer, three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT-III ANALOG ELECTRONICS 9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics

Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

UNIT-IV DIGITAL ELECTRONICS 9

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

UNIT-V MEASUREMENTS AND INSTRUMENTATION 9

Functional elements of an instrument, Standards and calibration, Operating Principle, types Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram-Data acquisition.

TOTAL: 45 PERIODS

COURSE OUTCOMES

1. Ability to compute the electric circuit parameters for simple problems
2. Ability to explain the working principle and applications of electrical machines
3. Ability to analyze the characteristics of analog electronic devices
4. Ability to explain the basic concepts of digital electronics
5. Ability to explain the operating principles of measuring instruments

TEXTBOOKS

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020
2. S.K. Bhattacharya “Basic Electrical and Electronics Engineering”, Pearson Education, Second Edition, 2017.
3. Sedha R.S., “A textbook book of Applied Electronics”, S. Chand & Co., 2008
4. James A. Svoboda, Richard C. Dorf, “Dorf’s Introduction to Electric Circuits”, Wiley, 2018.

5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

REFERENCE BOOKS

1. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
3. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

CO - PO and CO - PSO MAPPING

GE3131	PROGRAM OUTCOMES												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	2			3						2		2	
CO2	3	2				2		2					1	2		2
CO3	2	3	2	2									3			
CO4	3	3	1		3		2						1		3	
CO5	3	3	2	1			1						2	1		2
Average	**2.8**	**2.8**	**1.7**	**1.6**	**3**	**2**	**2**	**2**					**1.8**	**1.5**	**2.5**	**2**

(1–LOW, 2– MEDIUM, 3–HIGH)

GE3111	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE 3

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 3

Hero stone to modernsculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -Massive Terracotta sculptures, Village deities.

UNIT-III: FOLK AND MARTIAL ARTS 3

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

UNIT-IV: THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils –Tamil Sangam- 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 BOOK AND REFERENCE :

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

GE3111	தமிழர்மரபு	L	T	P	C
		1	0	0	1

அலகு I மொழி மற்றும் இலக்கியம் **3**

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள்- தமிழ் ஒரு செம்மொழி- தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம்- திருக்குறளில் மேலாண்மைக் கருத்துகள்- தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள்- சிற்றிலக்கியங்கள்- தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் – சிற்பக் கலை **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை –ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் , பொம்மைகள்- தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள்

அலகு III நாட்டுபுறக் கலைகள் மற்றும் வீர விளையாட்டுகள் **3**

நாட்டுப்புற கதைகள், பாடல்கள்-தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து- ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம்- வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்

அலகு IV: தமிழர்களின் திணைக் கோட்பாடுகள் **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள்- தமிழர்கள் போற்றிய அறக்கோட்பாடு –தமிழ் சங்கம்-சங்கம் வளர்த்த தமிழ்- சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும்- சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி

அலகு V: இந்திய தேசிய இயக்கம் மற்றும் இந்திய **3**

பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியா மற்றும் வெளிநாட்டின் பிற பகுதிகளின் தமிழ்ப் பண்பாட்டின் தாக்கம்- சுயமாரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு

TOTAL : 15 PERIODS

TEXT BOOKS &REFERENCE :

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

EN3119	ENGLISH LANGUAGE LEARNING LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

1. Enhance the employability and career skills of students.
2. Orient the students towards grooming as a professional.
3. Make them industry ready.
4. Develop their confidence and help them attend interviews successfully.
5. Help students to interact confidently in a professional scenario.

UNIT-I: PRONUNCIATION **6**

Tone- Pronunciation – Intonation- Reading Aloud and Addressing- Syllable-Rhythm-Accent- Wrongly Pronounced words -Poetry Reading

UNIT-II: NON VERBAL COMMUNICATION **6**

Non Verbal Communication - Facial expressions- Eye contact - Subtle (and not so subtle) gestures -Tone of voice – Touch- Posture -Personal space.

UNIT-III: SELF INTRODUCTION AND PRESENTATION **6**

Self Introduction- Introducing oneself to the audience- Introducing the Topic – answering questions – Individual Presentation Practice – Presenting Visuals effectively -5 Minute Presentations.

UNIT-IV: GROUP DISCUSSION **6**

Recognizing differences between groups and teams – managing time – networking professionally – Respecting social protocols- understanding career management – Developing a long - term career plan- making career changes.

UNIT – V: ADVANCED ENGINEERING MATERIALS **9**

Introduction to Group Discussion – Participating in Group discussions – Understanding group dynamics – Brainstorming the Topic – Questioning and Clarifying – GD Strategies – activities to improve GD Skills.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able

1. Pronounce the words correctly.
2. Understand the nonverbal clues.
3. Make an effective presentation.
4. Adequate soft skills required for the workplace.
5. Participate confidently in Group Discussions.

REFERENCE BOOKS:

1. Professional Communication by Meenakshi Raman & Sangeeta Sharma, Oxford Univ.Press, 2014.
2. Soft Skills by S. Hariharan , N. Soundarajaran and S.P. Shanmugapriya MJP Publishers, Edition: 2013

CO - PO and CO - PSO MAPPING																
EN3119	**PROGRAM OUTCOMES**												**PSO's**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1				1						3		1				
CO2	1	1					1			2		1				
CO3	2	2	1	2	2					3		1				
CO4	2	1	1				3			3		1				
CO5		1		1						3		1				
Average	**1**	**1**	**0.4**	**0.8**	**0.4**		**0.8**			**2.2**		**1**				

(1–LOW, 2– MEDIUM, 3–HIGH)

GE3121	PHYSICS AND CHEMISTRY LABORATORY	L T P C 0 0 4 2

(Common to all branches of B.E. / B.Tech Programmes)

OBJECTIVES:

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Calculation of lattice cell parameter – X-ray diffraction method.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
3. (a). Compact disc- Determination of width of the groove using Laser.
   (b). Determination of particle size using Laser
4. (a) Determination of wavelength using Laser
   (b) Determination of acceptance angle and numerical aperture in an optical fiber.
5. Determination of Planck's constant using LED.
6. Determination of thickness of a thin wire – Air wedge method
7. Determination of wavelength of mercury spectrum – spectrometer grating
8. Determination of rigidity modulus – Torsion pendulum
9. Determination of Young's modulus by non-uniform bending method.

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course, the students should be able

1. Understand the functioning of various physics laboratory equipment.
2. Use graphical models to analyze laboratory data.
3. Use mathematical models as a medium for quantitative reasoning and describing physical reality.
4. Access, process and analyze scientific information.
5. Solve problems individually and collaboratively.

REFERENCE

1. Wilson J.D. and Hernaandez Hall C.A.,— Physics Laboratory Experiments, Houghton Mifflin Company, New York, 2005.
2. S. Srinivasan, A Text Book of Practical Physics, S. Sultan Chand publications. 2005
3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

CO - PO and CO - PSO MAPPING

GE3121	PROGRAM OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-		-	-	-		-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2.4**	**2.6**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

(1–LOW, 2– MEDIUM, 3–HIGH)

CHEMISTRY LABORATORY: (Any five experiments to be conducted)
OBJECTIVES

1. To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, TDS, chloride, and chlorine.
2. To familiarise the students with electroanalytical techniques like conductometry and flame photometry to determine the impurities in aqueous solution.
3. To find the various characteristics of domestic water.
4. To understand the Pseudo first-order kinetics reaction.
5. To make the students know the synthesis of nanoparticles.

LIST OF EXPERIMENTS

1. Determination of chloride content of water sample by Argentometric method.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.
5. Determination of types and amount of alkalinity in water samples.
6. Estimation of available chlorine in bleaching powder solution.
7. Conductometric titration of barium chloride against sodium sulfate (Precipitation titration).
8. Estimation of sodium /potassium present in water using a flame photometer.
9. Estimation of TDS of a water sample by gravimetry.
10. Preparation of nanoparticles (Ag/Au/TiO_2/ZnO/CuO).
11. Pseudo first-order kinetics- ester hydrolysis.

TOTAL: 30 PERIODS

OUTCOMES

At the end of the course, the student should be able:

1. To infer the quality of water samples for alkalinity, hardness, DO, TDS, chloride, and chlorine.
2. To apply the knowledge on the estimation of metal ions, acidity and its precipitation nature towards their process.
3. To recognize the threshold limit for various characteristics of domestic water.
4. To identify the simple method of synthesis of nanoparticles.
5. To understand the pseudo first-order kinetics reaction from ester hydrolysis.

TEXTBOOKS

1. Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014).
2. Suchi Tiwari, Engineering Chemistry Lab Manual, Scitech Publications (India) Pvt. Ltd. (2nd Edition, 2013).
3. Pushpendra Kumar, Laboratory Manual for Engineering Chemistry, Reyansh Authortopic Pvt. Ltd., (1st Edition, 2022).

CO - PO and CO - PSO MAPPING

GE3121	PROGRAM OUTCOMES												Program Specific Outcomes			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	3	1	1	-	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	2	-	-	-	-	-	-	1	-	2	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2.4**	**2.6**	**1**	**1.2**	**-**	**0.2**	**-**	**-**	**-**	**-**	**0.2**	**-**	**0.4**	**-**	**-**

(1–LOW, 2– MEDIUM, 3–HIGH)

GE3134	ENGINEERING PRACTICES LABORATORY	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	0	0	4	2

COURSE OBJECTIVES:

1. To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
2. To provide hands on training for fabrication of components using carpentry, sheet metal and welding equipment / tools.
3. To gain the skills for making fitting joints and assembling air conditioner.
4. To develop the skills for making simple electrical wiring connections using suitable tools.
5. To provide hands on experience for soldering and gain knowledge about the behavior of electronics components.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 15

Buildings:

a) Study of plumbing and carpentry components of residential and industrial buildings safety aspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

b) Study of pipe connections requirements for pumps and turbines.

c) Preparation of plumbing line sketches for water supply and sewage works.

d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry works:

a) Study of the joints in roofs, doors, windows and furniture.

b) Hands-on-exercise:
Wood work, joints by sawing, planning and cutting.

II MECHANICAL ENGINEERING PRACTICE **15**

Welding:

a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.

b) Gas welding practice - Study

Basic Machining:

a) Facing

b) Simple Turning

c) Step Turning

Sheet Metal Work:

a) Forming & Bending

b) Model making – Trays

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending.

b) Foundry operations like mould preparation for gear and step cone pulley.

c) Assembly of centrifugal pump

d) Assembly of air conditioner

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE **15**

1. Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket.
2. Light and Fan Wiring.
3. Staircase Wiring.
4. Measurement of Voltage, Current, Power and Power factor in electrical circuit.
5. Measurement of Energy using Analog & Digital Energy meter.
6. Measurement of Earth Resistance.
7. Study of Industrial house wiring.
8. Identification & Study of protective devices: Fuses & Fuse carriers, MCB, ELCB and Isolators with ratings and usage.

IV ELECTRONICS ENGINEERING PRACTICE **15**

1. Study of Electronic components and equipment – Resistor, colour coding measurement of AC
2. Signal parameter (peak-peak, RMS period, frequency) using CR.
3. Study of logic gates AND, OR, EX-OR and NOT.

4. Generation of Clock Signal.
5. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
6. Measurement of ripple factor of HWR and FWR.

COURSE OUTCOMES:

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

1. Carry out various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
2. Fabricate carpentry components and pipe connections including plumbing works and use welding equipment's to join the structures.
3. Carry out the basic machining operations, make the models using sheet metalwork. Illustrate on the centrifugal pump, air conditioner, operations of smithy, foundry and fittings
4. Carry out basic home electrical works and measure the electrical quantities
5. Elaborate on the electronics components, gates and soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2. Carpentry vice (fitted to work bench)	15 Nos.
3. Standard woodworking tools	15 Sets

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets
7. Moulding table, foundry tools	2 Sets
8. Power Tool: Angle Grinder	2 Nos.
9. Study-purpose items: centrifugal pump, air-conditioner	One each
10. Fitting tools, Hack saw frame, 12' file, hack saw blade	15 Nos.

ELECTRICAL

1.	Assorted electrical components for house wiring	15 Sets
2.	Fluorescent Lamp	15 Sets
3.	Electrical measuring instruments	10 Sets
4.	Analog & Digital energy meter	5 Sets
5.	Megger	2
6.	Fan Regulator (Resistor & Electronic Type)	5
7.	Iron Box	2

ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
4. Multimeters 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

CO - PO and CO - PSO MAPPING

GE3134	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3					1						1	2		3	
CO2		1	2		3						1				2	
CO3				3	2							1	1			2
CO4		2	3	1	2											
CO5		3	2	2					1							
Average	**0.6**	**2**	**1.4**	**1.2**	**1.2**	**0.2**			**0.2**		**0.2**	**0.4**	**0.6**		**1**	**0.4**

(1–LOW, 2– MEDIUM, 3–HIGH)

EN3211	PROFESSIONAL ENGLISH – II	L	T	P	C
		3	0	0	3

OBJECTIVES:

The course prepares the second semester Engineering students

1. To develop strategies and techniques to enhance their reading skills.
2. To engage them in meaningful activities in order to improve their listening, speaking, reading and writing skills.
3. To improve their ability to write effective job application, resumes and draft impressive reports.
4. To develop analytical thinking skills for problem solving in communicative contexts.
5. To participate in group discussions.

UNIT-I: MAKING COMPARISON 9

Listening: Clippings of Ted talk, cartoon and interviews of sports personalities for listening and discussion.

Speaking: Descriptions and discussions based on newspaper.

Reading: Learning shades of meaning (using Thesaurus) and inferring the context from general passages.

Writing: Compare & Contrast essays and Jumbled Sentences.

Language and Vocabulary development: Prepositional phrases, contextual meaning of words. Verbal Analogy, Same word used as Noun and Verb

UNIT-II: EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING 9

Listening: Anecdotes to be read from books like Chicken Soup books. Evaluative listening – Advertisement and Product description.

Speaking: Marketing a product, persuasive speech

Reading: Description of any product / jewellery, Brochures and Manual.

Writing: Formal letters- letters of complaint, appreciation, and suggestion, Comprehension and E-mail (formal)

Language and Vocabulary development: Active & Passive, Infinitive, Gerund, Purpose Statements, Adverbs and Word formation

UNIT-III: ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 9

Listening: Listen to English songs and find the lyrics/new words

Speaking: Role play and Interviews

Reading: Reading magazine articles, Excerpts from literary texts

Writing: Job Application, Resume, Cover letter, SWOC Analysis and Recommendations.

Language and Vocabulary development: Correction of errors, If conditional, Sentence completion and Connotations.

UNIT-IV: ANALYZING PROBLEMS AND EXPRESSING SOLUTIONS 9

Listening: Watching Stand-up comedies and comprehending ideas expressed there.

Speaking: Speak about the Stand-up comedies viewed and express personal views about the same

Reading: Reading different types of books (novels, short stories, biographies, magazines etc. and speaking about the same.

Writing: Dialogue Writing, Checklist and Problem Solving essays.

Language and Vocabulary development: Reported Speech, Modals, Slogan writing and Conjunctions.

UNIT – V: REPORTING EVENTS 9

Listening: Listening to spot errors, listening to varied dialects and accents of English.

Speaking: Group discussion- Expression of opinions, assertion, coercion etc.

Reading: Reading life experiences of common man from magazines.

Writing: Accident Report / Survey Report and Letters to the Editor.

Language and Vocabulary development: Numerical Adjective, Idioms, Vocabulary – Shades of Meaning.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able

1. To compare and contrast ideas and information from technical texts.
2. To incorporate basic grammar structures to express appreciation, suggestion and complaint in writing**.**
3. To draft effective resumes using appropriate vocabulary and to avoid common errors.
4. To analyse problems so as to arrive at appropriate solutions and to communicate relevantly.

5. To draft technical reports, letters and to express ideas creatively.

TEXTBOOKS:

1. English for Science and Technology Cambridge University Press,2021. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deep Mary Francis, Dr.K.N.Shoba and Dr.Lourdes Joevani, Department of English, Anna University.
2. Technical Communication – Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford Univ.Press, 2016, New Delhi.
3. Technical English for Professional – Advanced by C. Gangalakshmi, B. Rathika and L. Saranraj, Cengage Learning India Pvt. Ltd.,2022.

REFERENCE BOOKS:

1. Learning to communicate – Dr. V. Chellammal, Oxford Univ.Press,2001 New Delhi.
2. Business Correspondence and Report Writing by Prof. R. C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
4. Improve Your Writing ed. V.N Arora Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
5. English For Engineers and Technologists, Orient Blackswan Private Ltd. Department of English, Anna University,2020

CO - PO and CO - PSO MAPPING

EN3211	**PROGRAM OUTCOMES**												**PSO's**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	1	2	1	-	-	-	-	-	3	-	1	-	-	-	-
CO2	2	2	1	2	2	-	-	-	-	3	1	1	-	-	-	-
CO3	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-
CO4	2	3	2	3	-	-	2	-	-	3	-	-	-	-	-	-
CO5	2	-	1		-	-	-	-	-	2	-	-	-	-	-	-
Average	**1.2**	**1.2**	**1.4**	**1.2**	**0.4**		**0.**			**2.8**	**0.2**	**0.4**				

(1–LOW, 2– MEDIUM, 3–HIGH)

MA3222 STATISTICS AND NUMERICAL METHODS L T P C

3 1 0 4

OBJECTIVES:

1. This course aims at providing the necessary basic concepts of statistical and
2. Numerical Methods for solving numerically different problems of engineering and technology.
3. To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
4. To introduce the basic concepts of solving algebraic and transcendental equations.
5. To introduce the numerical techniques of interpolation in various intervals and differentiation and integration in engineering and technology disciplines.
6. To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT-I: STATISTICAL HYPOTHESIS TESTS 9L+3T

Sampling distributions - Tests for single mean and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT-II: EXPERIMENTAL DESIGN FOR ANOVA 9L+3T

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design

UNIT-III: SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9L+3T

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton - Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative method of Gauss Seidel – Dominant Eigenvalue of a matrix by Power method.

UNIT-IV: INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9L+3T

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical integrations using Trapezoidal, Simpson's rules.

UNIT-V: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9L+3T**

Single step methods: Taylor's series method - Euler's method - Modified Euler's method Fourth order Runge-Kutta method for solving first order equations - Multi step methods: Milne's and Adams -Bash forth predictor corrector methods for solving first order equations. **TOTAL: 45L+15T PERIOD**

OUTCOMES:

1. Apply the concept of testing of hypothesis for small and large samples in real life problems.
2. Apply the basic concepts of classifications design of experiments in the field of agriculture.
3. Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
4. Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
5. Solve the ordinary differential equations with initial and boundary conditions by using certain techniques with engineering application.

TEXT BOOKS:

6. Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10^{th} Edition, Khanna Publishers, New Delhi,2015.
7. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8^{th} Edition,2015.

REFERENCE BOOKS:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9^{th} Edition, Cengage Learning,2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8^{th} Edition, 2014.
3. Gerald.C.F., Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia,NewDelhi,2006.

CO - PO and CO - PSO MAPPING

MA3222	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Average	**3**	**3**											**3**			

(1–LOW, 2– MEDIUM, 3–HIGH)

PH3225	MATERIALS SCIENCE	L	T	P	C
	(For Second Semester B.E. Mechanical Engineering)	3	0	0	3

OBJECTIVES:

1. To understand about the interatomic bonding and deformation mechanism.
2. To understand the concept of various phase diagrams and their applications.
3. To facilitate the knowledge about Iron carbide system and its micro structures.
4. To enrich the idea of mechanical properties and Hardness measurements.
5. To enhance the advanced knowledge on ceramics, composites and nanomaterials

UNIT-I: INTERATOMIC FORCES AND IMPERFECTION IN SOLIDS 9

Introduction - forces between atoms - interatomic bonding - Ionic, covalent and metallic bonding - Intermolecular bonding - dispersion, dipole and hydrogen bonding. Imperfections - point, line, surface and volume - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods – Hall-petch relation- strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening

UNIT-II: PHASE DIAGRAMS 9

Solid solutions - Hume Rothery's rules - the phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions - free energy composition curves for binary systems - microstructural change during cooling.

UNIT-III: FERROUS ALLOYS 9

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructure of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - diffusion in solids - Fick's laws - phase transformations - TTT- diagram for eutectoid steel - pearlitic, bainitic and martensitic transformations - tempering of martensite - steels - stainless steels - cast irons.

UNIT-IV: MECHANICAL PROPERTIES 9

Tensile test - creep resistance - creep curves - mechanisms of creep - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and

Vickers microhardness – Nanoindentation

UNIT – V: ADVANCED ENGINEERING MATERIALS 9

Metallic glasses: types - melt spinning process - properties and applications - Shape memory alloys - shape memory effect, pseudo elastic effect, properties of Ni-Ti alloy - applications: SMA blood clot filter - Ceramics - Super hard materials - Tungsten carbide and Boron nitrides - Graphene - Applications - Superplastic forming - Bulk nanostructured materials by Severe Plastic Deformation (SPD) - Nanomaterials - properties - Nanoparticle thin film coating for self-cleaning applications

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able

1. To acquire knowledge on the correlation of bonding and defects in various properties of materials.
2. To gain knowledge on the various phase diagrams and their applications
3. To acquire knowledge on Fe-Fe_3C phase diagram, various microstructures and alloys
4. To get knowledge on mechanical properties of materials and their measurement
5. To understand the basics of ceramics, composites and nanomaterials.

TEXTBOOKS:

1. O.P. Khanna – Materials Science & Metallurgy, Dhanpat Raj Publications, 2015.
2. Balasubramaniam, R. - Callister's Materials Science and Engineering‖. Wiley India Pvt.Ltd., 2014.
3. Raghavan, V. - Physical Metallurgy: Principles and Practice. PHI Learning, 2015.
4. 4.Raghavan, V. - Materials Science and Engineering: A First course‖. PHI Learning, 2015

REFERENCE BOOKS:

1. U.C. Jindal, Materials Science & Metallurgy, Pearson Publication, 2012.
2. Askeland, D. - Materials Science and Engineering. Brooks/Cole, 2010.
3. S.Mohan, V.Arjunan, Sujin P. Jose & M. Kanchana Mala, Principles of Materials Science, MJP Publishers, 2016.

4. Wahab, M.A. -Solid State Physics: Structure and Properties of Materials‖ Narosa Publishing House, 2009.

CO - PO and CO - PSO MAPPING

PH3225	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	1	-	-	-	-
CO3	3	2	1	-	-	-	1	-	-	-	-	1	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	1	-	-	-	-
CO5	1	2	2	1	-	1	1	-	-	-	-	1	-	-	-	-
Average	**2.6**	**2**	**1.3**	**1.2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

(1–LOW, 2– MEDIUM, 3–HIGH)

CH3225 CHEMISTRY OF FUNCTIONAL MATERIALS L T P C

(Second Semester-B.E., Mechanical Engineering)

OBJECTIVES:

1. To explain the basic concept of electrochemistry, and corrosion science to control corrosion.
2. To introduce the basic concepts and applications of phase rule and alloys.
3. To impart knowledge on the basis of engineering materials, preparatory methods, and their applications.
4. To apply the knowledge on fuels and combustion behaviors with their properties.
5. To identify the energy sources, operating principles, and applications of energy conversion and storage devices.

UNIT-I: ELECTROCHEMISTRY & CORROSION 9

Electrode – electrode reaction - redox reaction - origin of electrode potential, oxidation potential - reduction potential - measurement and applications, electrochemical series and its significance - electrochemical cell - Nernst equation (derivation). Corrosion - causes - factors - types - chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electroplating of Au - electroless plating of Ni - paints - constituents and function.

UNIT-II: PHASE RULE AND ALLOYS 9

Phase rule: introduction, the definition of terms with examples, one component system (water system) - reduced phase rule - construction of phase diagram by thermal analysis - simple eutectic systems, two-component systems (Zn-Mg system). Alloys: introduction - definition-properties of alloys - significance of alloying, functions, and effect of alloying elements-ferrous alloys - Nichrome and stainless steel - types (18/8) - heat treatment of steel, non-ferrous alloys – brass and bronze

UNIT-III: ENGINEERING MATERIALS 9

Abrasives - natural abrasives, artificial abrasives. Refractories - properties-manufacture, common refractory bricks, insulating refractories, cermets, inorganic cermeting materials. Cement: manufacturing of cement, setting and hardening, types and uses- gypsum plaster. Engineering plastics: reinforced or filled plastics, polymer blends, and alloys

UNIT-IV: ENERGY SOURCES AND STORAGE DEVICES 9

Introduction - nuclear energy - light water nuclear power plant - breeder reactor, solar energy conversion - solar cells: Principle, working and applications, types of batteries - primary battery (alkaline battery), secondary battery (lead acid battery, NICAD battery, lithium-ion battery), fuel cells (H_2-O_2 fuel cell). Supercapacitors: storage principle, applications. Electric vehicles - working principles.

UNIT – V: FUELS AND COMBUSTION 9

Fuels: Introduction - fossil fuels – alternate fuels - need for advanced fuels - manufacture of synthetic petrol (Bergius process), octane number, cetane number - characteristics and advantages of biodiesel, ethanol, hydrogen, propane and natural gas. Combustion: Introduction - Calorific value - higher and lower calorific values - ignition temperature, spontaneous ignition temperature, explosive range, emission characteristics - CO2 emission and Footprint- essential requirement for complete combustion.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able

1. To infer the importance of electrochemistry and corrosion.
2. To identify a strong foundational knowledge in phase rule systems and alloys.
3. To apply the knowledge of engineering materials for application requirements.
4. To recommend suitable fuels for engineering processes and applications.
5. To recognize the energy resources for suitable applications in energy storage sectors

TEXTBOOKS:

1. P. C. Jain and Monica Jain, “Engineering Chemistry”, 18th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2021.
2. S.S. Dara and S.S. Umare, “A Text Book of Engineering Chemistry”, 12th Edition, S. Chand & Company LTD, New Delhi, 2021.
3. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Publishing Company LTD, 2023.

REFERENCE BOOKS:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath, and James Murday, “Textbook of nanoscience and nanotechnology”, Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, “Engineering Chemistry” McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Shikha Agarwal, “Engineering Chemistry” - Fundamentals and Applications, 2nd Edition, Cambridge University Press, New Delhi, 2019.

CO - PO and CO - PSO MAPPING

CH3225	PROGRAM OUTCOMES												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	1	2	2	-	-	-	-	-	-	1	-	1	-	-
CO2	2	1	1	2	1	-	-	-	-	-	-	1	1	1	-	-
CO3	3	3	2	2	2	-	-	-	-	-	-	1	1	1	-	-
CO4	3	2	1	2	1	-	-	-	-	-	-	1	1	2	-	-
CO5	3	3	2	2	1	-	1	-	-	-	-	1	1	1	-	-
Average	**2.8**	**2.2**	**1.4**	**2**	**1.4**	**-**	**0.2**	**-**	**-**	**-**	**-**	**1**	**0.8**	**1.2**	**-**	**-**

(1–LOW, 2– MEDIUM, 3–HIGH)

GE3231	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
	(Common to All branches)	3	0	0	3

OBJECTIVES

1. To know the basics of Python programming and write simple programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and call them.
4. To use Python data structures and its implementation – lists, tuples, dictionaries.
5. To understand Object Oriented Concept in Python.

UNIT I PYTHON BASICS 9

Introduction to Python – Literals – Variables and Identiiers – Data Types – Input Operation – Comments – Reserved words – Indentation – Operators and Expressions – Modes of python. Conditionals: Boolean values and operators - conditional if - alternative if - chained conditional - Iteration, Illustrative programs: Basic Arithmetic Operations, GCD of numbers, Square root (Newton's Method).

UNIT II FUNCTIONS, LIST, TUPLES 9

Functions, function definition and use. **Fruitful functions:** return values, parameters, local and global scope, recursion. **Lists:** list operations, list slices, list methods, list loop, mutability, list parameters; **Tuples:** tuple assignment, tuple as return value. Comparison of Lists and tuples. Illustrative programs: exchange the values of two variables, square root, Linear and Binary search. Fibonacci series using functions.

UNIT III STRINGS, DICTIONARY, SET 9

Strings: string slices, immutability, string functions and methods, string module. **Dictionaries:** Operations (create, access, add, remove) and methods. (Insert, delete).Set operation (Access, Add, Remove). Illustrative programs: creates a dictionary of radius of a circle and its circumference.

UNIT IV FILES, EXCEPTIONS, MODULES AND PACKAGES 9

Files and exception: Text Files, Reading and Writing files, Format operator; Errors and Exceptions, Handling Exceptions, Multiple Except blocks, Modules, Packages; Illustrative programs: word count, copy file, Creating user defined Exceptions.

UNIT V CLASSES AND OBJECTS 9

Classes and Objects: Introduction, Classes and Objects, Defining Classes, Creating Objects, Data Abstraction and Hiding, The Class Method and Self Argument, The _init_( ) method, Class Variables and Object Variables, Public and Private data members, Private Methods. Illustrative Programs: Creating Student Class and Objects.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

1. Develop simple computational problems using control flow statements.
2. Decompose a Python program into functions, Modules and Packages.
3. Represent compound data using Python lists, tuples, Strings, Set and dictionaries.
4. Read and write data from/to files and Exception handling in Python Programs.
5. Understand the concepts of Object Oriented Programming and to develop real time applications.

TEXT BOOKS:

1. Reema Thareja, **"**Python Programming using Problem solving Approach", Oxford Higher Education,2018.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.Com/ wp/think-python/)
3. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python" – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, **"**Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.

4. Paul Gries, Jennifer Campbell and Jason Montojo, **"Practical Programming: An Introduction to Computer Science using Python 3"**, Second edition, Pragmatic Programmers,LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, **"Introduction to Programming in Python: An Inter-disciplinary Approach"**, Pearson India Education Services Pvt. Ltd., 2016.

WEB REFERENCES:

1. http://greenteapress.com/wp/think-python/
2. www.docs.python.org
3. https://nptel.ac.in/courses/106/106/106106182/

CO - PO and CO - PSO MAPPING

GE3231	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
1	3	3	3	3	2	-	-	-	-	-	2	2	2	-	-	1
2	3	3	3	3	2	-	-	-	-	-	2	2	-	-	3	-
3	3	3	3	3	2	-	-	-	-	-	2	-	-	-	1	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	2	-
5	1	2	-	-	1	-	-	-	-	-	1	-	-	-	-	1
Average	**2.4**	**2.6**	**3**	**2.8**	**1.8**						**1.6**	**2**	**2.5**		**2**	**1**

(1–LOW, 2– MEDIUM, 3–HIGH)

GE3211	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT-I: Weaving and Ceramic Technology 3

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

UNIT-II: Design and Construction Technology 3

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 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting ofCoins – 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 3

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 3

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 & REFERENCE :

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

3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4.பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

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

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) –

GE3211	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

அலகு I நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் 3

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் -பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் 3

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும்நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப்பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக்கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சிஅம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு.வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக்கட்டிடக் கலை.

அலகு III உற்பத்தி தொழில்நுட்பம் 3

உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை - உலோகவியல் -இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள்அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள்,கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்குமணிகள்-எலும்புத்துண்டுகள்-தொல்லியல்சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV: விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பம் 3

குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் -கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்டகிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்தசெயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும்முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்

அலகு V: அறிவியல் தமிழ் & தமிழ் கணினி 3

அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி -தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ்மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் -தமிழ் மின் நூலகம் - ணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத்திட்டம்.

TOTAL : 15 PERIODS

உரை புத்தகங்கள் & குறிப்பு புத்தகங்கள்:

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

GE3233	ENGINEERING GRAPHICS AND DESIGN	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	1	0	4	3

OBJECTIVES:

The main learning objective of this course is to impart knowledge

1. To draw the conics curves and special curves, use BIS conventions, and specifications for engineering drawing.
2. To draw the orthographic projection of lines and plane surfaces.
3. To draw the projections and solids and Isometric projection of simple solids.
4. To draw the section of solids and the development of surfaces.
5. To draw free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination) 1

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

UNIT-I: PLANE CURVES AND SPECIAL CURVES 10

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid (Rolling Circle rolls on flat surface only). construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT-II: PROJECTION OF POINTS, LINES AND PLANE SURFACES 16

Orthographic projection- Principles-Principal planes - First angle projection-projection of points at the First Quadrant only. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) which inclined to both the principal planes by rotating object method.

UNIT-III: PROJECTION OF SOLIDS AND ISOMETRIC PROJECTION 16

Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to one of the principal planes by the rotating object method. Principles of isometric projection – isometric scale – Isometric projections of simple solids - Prisms,

pyramids, cylinders, cones - isometric view of the object from the 2D coded plan.

UNIT-IV: PROJECTION OF SECTIONED SOLIDS & DEVELOPMENT OF SURFACES **16**

Sectioning of the above solids in the simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining the true shape of the section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT-V: FREE-HAND SKETCHING AND PERSPECTIVE PROJECTIONS **16**

Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects. Perspective projection of simple solids-Prisms and pyramids by visual ray method.

TOTAL: (L=15; P=60) 75 PERIODS

COURSE OUTCOMES:

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

1. To construct the conics curves & special curves, use BIS conventions, and specifications for engineering drawing.
2. To construct the orthographic projection of lines and plane surfaces.
3. To construct the projections and solids and Isometric projection of simple solids.
4. To construct projections of section of solids and development of surfaces.
5. To construct free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids

TEXTBOOKS:

1. N.D.Bhatt, “Engineering Drawing (Plane and Solid Geometry)”, Charotar Publishing House PVT. LTD. 53rd Edition 2019 (Fifth Reprint)
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 15th Edition 2018

REFERENCE BOOKS:

1. T. Jeyapoovan, “Engineering Graphics Using Auto CAD”, Vikas Publishing House Pvt. LTD, seventh Edition, 2015.
2. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2011.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2013.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

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

CO - PO AND CO- PSO MAPPING

GE3233	PROGRAM OUTCOMES												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
CO2	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
CO3	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
CO4	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
CO5	3	1	2	-	2	-	-	-	-	3	-	2	2	1	-	1
Average	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**1**	**-**	**1**

(1-LOW,2-MEDIUM ,3-HIGH)

OBJECTIVES:

1. To gain practical knowledge and to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills and the study of practical applications.
3. To bring more confidence and ability to develop and fabricate engineering and technical equipment.
4. To learn problem solving skills related to physics principles and interpretation of experimental data.
5. To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

1. Determination of the electrical conductivity of metals by plotting a current-voltage characteristic curve.
2. Determination of band gap of a semiconductor.
3. Determination of Fermi energy. (Measurement of Fermi energy in copper).
4. Study of I-V characteristics of solar cell and determination of its efficiency
5. Determination of electrical resistivity of metal and alloy –Carey foster Bridge.
6. Measurement of susceptibility of paramagnetic solution by Quinke's method.
7. Study of magnetic Hysteresis-B-H curve.
8. Determination of the dark resistance of light detective resister (LDR).
9. Measurement of Temperature using LM35.

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course, the students should be able

1. To understand the functioning of various physics laboratory equipment.
2. To use graphical models to analyze the laboratory data and to solve problems individually and collaboratively.
3. Use mathematical models as a medium for quantitative reasoning and describing physical reality.
4. Access, process and analyze scientific information.
5. Solve problems individually and collaboratively.

TEXTBOOKS:

1. Wilson J.D. and Hernandez C.A., —Physics Laboratory Experimentsǁ, Houghton Mifflin
Company, New York, 2005.
2. S. Srinivasan, A Text Book of Practical physics, S. Sultan Chand publications. 2005
3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

GE3221	PROGRAM OUTCOMES												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-		-	-	-		-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2.4**	**2.6**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

(1–LOW, 2– MEDIUM, 3–HIGH)

CHEMISTRY LABORATORY: (Any five experiments to be conducted)

OBJECTIVES

1. To train the students in basic experimental skills in water contaminants such as copper and chromium.
2. To familiarise the students with electroanalytical techniques such as pH metry, potentiometry, and conductometry to determine impurities in aqueous solutions.
3. To familiarize the students with the determination of the molecular weight of a polymer by a viscometer.
4. To make the student up-to-date with the properties and nature of alloys experimentally.
5. To demonstrate the analysis of coal.

LIST OF EXPERIMENTS: CHEMISTRY LABORATORY

1. Estimation of copper content of the given solution by Iodometry.
2. Determination of strength and amount of acids in a mixture of acids using a conductivity meter.
3. Determination of strength and amount of HCl present in the whole of the given solution using a conductivity meter.
4. Estimation of the iron content of the given solution using a potentiometer.
5. Determination of chromium by EDTA titration.
6. Determination of strength of given hydrochloric acid using a pH meter.
7. Determine the molecular weight of the polyvinyl alcohol using an Ostwald viscometer.
8. Estimation of Nickel in steel.
9. Proximate Analysis of Coal.
10. Corrosion experiment-weight loss method.
11. Determination of COD value of industrial effluents.

TOTAL: 30 PERIODS

OUTCOMES

At the end of the course, the student should be able:

1. To find the quality of water samples for copper and chromium present in water.
2. To recognize the amount of various ions present in the water sample through volumetric and instrumentation techniques.
3. To identify the molecular weight of the polymer using an Ostwald viscometer.
4. To recognize an environmental hazardous and threshold limit for industrial effluents.
5. To recommend quality of coal and steel when it is exposed to various environment.

TEXT BOOKS

1. Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014).
2. Suchi Tiwari, Engineering Chemistry Lab Manual, Scitech Publications (India) Pvt. Ltd. (2nd Edition, 2013).
3. Pushpendra Kumar, Laboratory Manual for Engineering Chemistry, Reyansh Authortopic Pvt. Ltd., (1st Edition, 2022).

GE3221	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	1	1	1	1	-	1	-	-	-	-	-	-	-	-	-
CO2	2	2	1	1	1	-	-	-	-	-	-	-	-	2	-	-
CO3	2	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	1	1	2	2	2	-	-	-	-	-	-	-	-
CO5	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Average	**2**	**1.4**	**1**	**1**	**1.2**	**0.4**	**0.6**	**0.4**	**-**	**-**	**-**	**-**	**-**	**0.4**	**-**	**-**

(1–LOW, 2– MEDIUM, 3–HIGH)

GE3232 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY **L T P C 0 0 4 2**

OBJECTIVES:

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, dictionaries and read and write data from/to files in Python.
5. Use simple Object Oriented Concepts.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number. (Newton's method)
3. Find exponentiation of a number. (power of a number)
4. Find the maximum of a list of numbers.
5. Program for basic calculator operations using functions.
6. Generate Fibonacci series using function.
7. Program for Armstrong number.
8. Program for check the number is Palindrome or Not.
9. Program for sum of array of numbers.
10. How to create, slice, change, add, delete and index elements using list.
11. Linear search and Binary search.
12. Find First n prime numbers.
13. Program to remove duplicate elements from a list.
14. Program for addition and transpose of a matrix.
15. How to create, slice, change, delete and index elements using Tuple.
16. Write a program to reverse the string.
17. How to change, delete, add and remove elements in Dictionary.
18. Create a dictionary of radius of circle and its circumference.
19. Program for count the number of words in a file.
20. Find the most frequent words in a text read from a file.
21. Program for student information system using class and objects.
22. Program for Employee Payroll Processing using class and objects.

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

COURSE OUTCOMES

1. Develop solutions to simple computational problems using Python programs.
2. Solve problems using conditionals and loops in Python.
3. Develop Python programs by defining functions and calling them.
4. Use Python lists, tuples and dictionaries for representing compound data.
5. Develop Python programs using files and OOPS concept.

CO – PO – PSO Mapping

GE3232	PO												PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	3	3	-	-	-	-	-	3	2	1	3	-	-
CO2	3	3	3	3	3	-	-	-	-	-	3	2	-	-	2	-
CO3	3	3	3	3	2	-	-	-	-	-	2	-	-	3	-	2
CO4	3	2	-	2	2	-	-	-	-	-	1	-	-	-	1	-
CO5	1	2	-	-	1	-	-	-	-	-	1	-	1	-	2	2
Average	**2.6**	**2.6**	**3.0**	**2.8**	**2.2**						**2.0**	**2.0**	**1.0**	**3.0**	**1.7**	**2.0**

(1–LOW, 2– MEDIUM, 3–HIGH)

GE3251- NSS/NSO/YRC & CLUB ACTIVITIES

Course Code and Title : NSS/NSO/YRC/Club Activities

Unit – 1 : NATIONAL SERVICE SCHEME (NSS)

OBJECTIVES:

The main objectives of this course are:

1. To help learners know about NSS in the context of youth, community and voluntary service.
2. To teach the importance of health, hygiene and sanitation for a healthy Nation.
3. To understand the community in which they work.
4. To identify the problems of the community and involve them in problem-solving.
5. To develop the capacity to meet emergencies and natural disasters.
6. To practice the National integration and social harmony.
7. To utilize their knowledge in finding practical solutions to individual and community

CREDIT:

Total Lecture Hours / Semester	Total Tutorial Hours / Semester	Total Practical Hours / Semester	Credit
6	0	18	1*

* To be conducted after college hours and week ends

OUTCOME:

Learners will have the knowledge about NSS and its role in the fields of health, hygiene, emergencies & natural disasters and involve them in problem-solvingof the nearest community so as to build a strong country.

SYLLABUS:

SEMESTER : I&II ATTENDANCE WEIGHTAGE : 50 ACTIVITIES WEIGHTAGE : 50

Topic -I :Introduction and Basic Concepts of NSS [8]

a. History – Aim – Objectives of NSS

b. Emblem – Motto – Badge - Song

c. Organizational structure - Roles and Responsibilities of NSS d. Regular activities

e. Any approved indoor / outdoor programs by the Principal

Topic-II : Youth Leadership, Social Harmony and National Integration[8]

a. Meaning and types of Leadership

b. Qualities of good leaders and leadership

c. Importance and role of youth leadership

d. Role of youth in peace and Nation building

e. Any approved indoor / outdoor programs by the Principal

Topic-III :Health, Hygiene and Sanitation and Youth Health [8]

a. Definition, Needs and Scope of Health Education

b. Swachh Bharat Abhiyan

c. Healthy Lifestyles

d. HIV, AIDS, Drugs abuse

e. Any approved indoor / outdoor programs by the Principal

Topic-IV :Environment Issues, Emergencies and Disaster Management [8]

a. Environment conservation, enrichment and sustainability

b. Waste management

c. Natural resource management [Rain water harvesting and Energy conservation]

d. Introduction to Disaster Management, Classification of Disasters

e. Any approved indoor / outdoor programs by the Principal

References:

1. National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi.

2. National Youth Policy, Government of India, Ministry of Youth Affairs and Sports, New Delhi.

3. https://nss.gov.in/

NSO/YRC & CLUB ACTIVITIES

YOUTH RED CROSS – Social Service based activities

OBJECTIVES:

1. To enhance the societal awareness
2. To upgrade the Personality

ACTIVITIES **5**

1. **HEALTH PROMOTION**- Activities that promotes health (2)
2. **SOCIETAL SERVICE**-Social Service activities(2)
3. **FRIENDSHIP BUILDING** - Friendship building activities between communities (1)

COURSE OUTCOME

1. Enhanced Social Awareness
2. Personality development of the individual

References:

1. IRCS/YRC Handbook
2. https://www.indianredcross.org/youth/Guidelines-for-JYRC-LR.pdf

NSS/NSO/YRC & CLUB ACTIVITIES

தமிழ் மன்றம்

பாடத்திட்டத்தின் நோக்கங்கள்

1. மாணவர்களை சிறந்த மேடைப்பேச்சாளர்களாக உருவாக்குவது

2. தாய்மொழியின் மேன்மையை பாதுகாப்பது..

பயிற்சித்திட்டம்

1. பேச்சுக்கலைப் பயிற்சி
2. கவிதை மற்றும் கட்டுரைகள் எழுதும் பயிற்சி
3. அறிவியல் பொறியியல் தொழில்நுட்பங்களைத் தமிழில் எழுதுதல்.
4. பட்டிமன்ற மேடைகளில் பேசும் பயிற்சி.
5. நாட்டுப்புறப்பாடல்கள் பாடுதல் மற்றும் கதைகள் எழுதும் பயிற்சி.

கற்றல் முடிவு

1. பேச்சுக்கலைப் தேர்ச்சி
2. நாட்டுப்புறப்பாடல்கள் பற்றிய புரிதல்

மேற்கோள்கள்

https://eegarai.darkbb.com/t63483-topic

https://poriyari.in/

GE3251

RESONANCE – SKILL BASED ACTIVITIES

OBJECTIVES:

1. To know the basics and general principles of Physics.
2. To provide knowledge of the current trends in Physics.
3. To develop a solid scientific and technical competence for investigating and applying the relationships of Physics phenomena in *various fields of Physics.*

ACTIVITIES **5**

1. **QUIZ -** Basics and general principle (1)

2. **PAPER PRESENTATION** - Current trends (2)

3. **PROJECTS -** Fun with Physics (2)

COURSE OUTCOME

Students were able to:

- recollect the general principles of Physics.
- to explore the topics in the current trends in Physics.
- *develop practical expertise in various areas of Physics.*

REFERENCES:

1. Principles of Physics, 10Ed, Isv by Robert Resnick Jearl Walker, David Halliday (2015)
2. 'The Feynman Lectures on Physics' (Volume I, II and III) , Matthew Sands, Richard Feynman, and Robert B. Leighton.
3. https://www.science-sparks.com/top-5-physics-experiments-you-can-try-at-home
4. https://www.electronicsforu.com/category/electronics-projects/hardware-diy.

ECLECTIC LINGUA – SKILL BASED ACTIVITIES

OBJECTIVES:

1. To enhance the communicative competence of the first-year engineering students by means of creating opportunity for impromptu/ /spontaneous speeches.
2. To upgrade the English language skills of students by introducing appropriate vocabulary in different situations.

ACTIVITIES **5**

1. **Extempore**- Giving expression to thoughts (2)

2. **Building Vocabulary**-Using relevant set of words for different contexts (2)

3. **Pronunciation**- Speaking accurately and fluently (1)

COURSE OUTCOME

1. To enable students to express themselves easily and coherently.

2. To help students to speak the language using the right words and pronouncing them correctly.

Reference

https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=pronunciation

https://www.quillsandquotes.ca/post/12-fun-games-to-get-students-public-speaking

EULER.COM – Skill based activities

OBJECTIVES:

1. To enhance the Logical reasoning of the first-year engineering students by means of creating opportunity to improve the aptitude skill.
2. To explore the applications of Mathematics in the field of Engineering, Science and Technology and to utilize this skill for their academic activities.

ACTIVITIES **5**

1. **OLYMPIAD**- The students will be provided with 25 questions in Engineering Mathematics. This should be completed in one hour. **(1)**
2. **MATHEMATICAL MODELLING**- The students are expected to present physical models

(Working as well as static models) based on the application of Engineering Mathematics **(2)**

3. **PAPER PRESENTATION**- Students will be provided 5-7 minutes of time to present their findings in application of Mathematics. **(2)**

COURSE OUTCOME

1. To enable students to explore their mathematical reasoning skills.

2. To motivate the students to apply Mathematics in Engineering and Technology and demonstrate their work by means of Physical model and present their research article.

References:

1. Advanced Engineering Mathematics , Erwin Kreyszig, 10th Edition, Wiely India Pvt Ltd.
2. https://www.stewartcalculus.com/

CATALYSIS – SKILL-BASED ACTIVITIES

OBJECTIVES:

1. To inculcate a scientific attitude and temper.
2. To provide an opportunity to develop constructive, explorative & inventive ideas
3. among the students.
4. To develop training in the scientific method of problem-solving for engineering

1. Quiz/debate- the latest advancement in Chemistry towards engineering (2)
2. Essay competition/Chart preparation - Environmental sustainability (2)
3. Nature Study - field visit to eco-parks etc. (1)

COURSE OUTCOME

1. To promote inquisitiveness among the students and inculcate Scientific mind mapping.
2. To develop students, interest and participation in the practical applications of the knowledge related to environmental sciences.
3. Take part in practical, hands-on science activities close to nature.

REFERENCE

1. M. Senapati, Advanced Engineering Chemistry, Infinity science press, New Delhi,2007.
2. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/environmental-sustainability
   https://www.indiabix.com/general-knowledge/chemistry

FINE ARTS CLUB VECTORIANS – SKILL BASED ACTIVITIES

OBJECTIVES:

1. To enhance the inbuilt talents in arts and crafts and fine arts activities.
2. To explore and exhibit theirs qualities in cultural activities as well as in the leadership.

ACTIVITIES 5

1.ARTS & CRAFTS - The students will be given with innovative Theme, they have to Show their talents in one hour time with basic facilities provided. (1)

2. SINGING & DANCING - The students are expected to present their talents on spot or With given Theme, either solo or group performance. (2)

3. MIME & DRAMA - Students will be given 5 - 7 minutes of time to present their variety Entertainments in way of Mono acting or Drama . (2)

COURSE OUTCOME

1. To enable students to explore their inbuilt talents in fine arts activities.
2. To motivate the students to show case their cultural and leadership qualities.

REFERENCES:

1. https://www.youtube.com/watch?v=1mkESRWiSKc – Teach your own crafts.
2. https://www.youtube.com/watch?v=YHqwrDGywH4 – How to teach Arts & Crafts

NATIONAL SPORTS ORGANIZATION (NSO)

OBJECTIVES:

1. To create awareness about basic fitness and mental strength
2. To promote the development of physical fitness
3. To develop the sporting activities of the youth
4. To create the social responsibilities and social interaction through participation

ACTIVITIES **5**

INTRODUCTION - Introduction of NSO & Physical Fitness and games Skills Test (1)

PHYSICAL FITNESS ACTIVITIES - Importance of Basic Physical Fitness - BMI Calculation - Identification of deformities, (2)

SPORTS PRACTICE - Games and fitness activities Physical Fitness Activities (2)

COURSE OUTCOMES:

Get basic knowledge about physical and mental fitness

NSO create self-esteem and self confidence

NSO provide opportunity get social interaction

Development of character and personality through participation

REFERENCES:

1. www.google.com

2. https://scholar.google.com/

3. https://www.medindia.net/patients/lifestyleandwellness/five-essential-components-of-physical-fitness-references.htm

4. https://pubmed.ncbi.nlm.nih.gov/

MA3321	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

1. To introduce the effective mathematical tools for the solutions of partial differential equations.
2. To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
3. Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering.
4. To acquaint the student with Fourier transform techniques used in wide variety of situations.
5. To model several physical problems to develop Z transform techniques for discrete time systems.

UNIT-I: PARTIAL DIFFERENTIAL EQUATIONS 6

Solutions Lagrange's linear equation — linear partial differential equations of second and higher order with constant coefficients of homogeneous type

UNIT-II: FOURIER SERIES 6

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Harmonic analysis.

UNIT-III: LAPLACE TRANSFORMS 6

Existence conditions – Transforms of elementary functions – Basic properties – Inverse transforms – Convolution theorem – Transform of periodic functions.

UNIT-IV: FOURIER TRANSFORMS 6

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

UNIT – V: Z – TRANSFORMS AND DIFFERENCE EQUATIONS 9

Z- Transforms – Elementary properties – Inverse Z – transform (using partial fraction and residues) – Solution of difference equations using Z – transform.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students should be able

1. Understand the fundamental concept of the concepts of Partial differential Equations.
2. Understand the basic concepts of mathematical principles on Fourier & Z- transforms.
3. Laplace transform and inverse transform of simple functions, properties, are studied.
4. Apply the concept of Understand the concept Fourier series and apply the concept in solving PDE.
5. Understand the fundamental concept of the concepts of Solution of difference equations

TEXT BOOKS:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.

2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.

3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S. Viswanathan Publishers Pvt. Ltd.1998

REFERENCE BOOKS:

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, NewDelhi, 2008.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4. Erwin Kreyszig,"Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.5. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.

5. P.Sivaramakrishna Das, C.Vijayakumari, Transforms and Partial Differential Equations, Pearson India Education Services Pvt. Ltd, 2019.

CO - PO and CO - PSO MAPPING

MA3321	PROGRAM OUTCOMES												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3			1							1				
CO2	3	3			1							1				
CO3	3	3			1							1				
CO4	3	3			1							1				
CO5	3	3			1							1				
Average	3	3			**1**							**1**				

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3332	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

1. Learn the use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
2. Introduce the equilibrium of rigid bodies, vector methods and free body diagram.
3. Study and understand the distributed forces, surface, loading on beam and intensity.
4. Learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Develop basic dynamics concepts force, momentum, work and energy.

UNIT-I: BASICS OF PARTICLES 9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Action and Reaction.

UNIT-II: EQUILIBRIUM OF RIGID BODIES 9

Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force,- Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two Dimensions - Reactions at Supports and Connections.

UNIT-III: DISTRIBUTED FORCES 9

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

UNIT-IV: FRICTION **9**

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

UNIT-V: DYNAMICS OF PARTICLES **9**

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

TOTAL : 45 PERIODS

SKILL DEVELOPMENT ACTIVITIES

(Group Seminar/Mini Project/Assignment/Content Preparation/ Quiz /Surprise Test/Solving GATE Questions/etc.) **5**

1. Friction and its applications including rolling friction, belt-pulley, brakes, clutches, screw jack, wedge, vehicles.
2. Trusses and Frames
3. Kinematics and dynamics of rigid bodies in plane motion; impulse and momentum (linear and angular)
4. Energy formulations; Lagrange's equation
5. Familiarization of any one relevant software tool (Solid Works/SIM link/Adams/Equivalent open source software)

COURSE OUTCOMES:

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

1. Illustrate the vector and scalar representation of forces and moments.
2. Analyze the rigid body in equilibrium.
3. Evaluate the properties of distributed forces.
4. Determine the friction and the effects by the laws of friction.
5. Calculate dynamic forces exerted in rigid body.

TEXTBOOKS:

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

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

REFERENCE BOOKS:

1. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4th Edition, Pearson Education, 2005.
2. P Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
3. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, 5th Edition, McGraw Hill Higher Education, 2013.
4. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.

E-RESOURCES:

1. https://swayam.gov.in/nc_details/NPTEL
2. https://www.freecad.org/?lang=en
3. https://www.sculpteo.com/en/glossary/openscad-definition/
4. https://all3dp.com/2/best-open-source-cad-software/
5. https://gate.nptel.ac.in/

CO - PO and CO - PSO MAPPING

ME3332	PROGRAM OUTCOMES												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	3									3	3		
CO2	3	3	3	3									3	3		
CO3	3	3	3	3									3	3		
CO4	3	3	3	3									3	3		
CO5	3	3	3	3									3	3		
Average	3	3	3	3									3	3		

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3363	ENGINEERING THERMODYNAMICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

1. Understand the basic concepts of Engineering thermodynamics and application to the first law of thermodynamics.
2. Understand the second law of thermodynamics and its application to then thermodynamic systems and concepts of entropy and exergy.
3. Know the application of the second law of thermodynamics and understand the availability concepts.
4. Know the various thermodynamic properties and to understand the concept of steam power cycles and its application in the steam power plants.
5. Know the various properties of the ideal and real gas and the significance of compressibility factor in gas mixtures and the various property relations involved in thermodynamics.

(Use of steam tables and psychrometric chart is permitted)

UNIT-I: BASIC CONCEPTS AND FIRST LAW 9

Basic concepts - Thermodynamic systems, Properties and processes. Thermodynamic Equilibrium - Displacement work - P-V diagram. Heat and work transfer. Zeroth law – concept of temperature and temperature scales –First law of thermodynamics – application to closed and open systems – steady and unsteady flow processes.

UNIT-II: SECOND LAW AND ENTROPY 9

Heat Reservoir, source and sink. Heat Engine, Refrigerator, and Heat pump. Statements of second law and its corollaries. Carnot cycle Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change for - pure substance.

UNIT-III: AVAILABILITY AND APPLICATION OF II LAW 9

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

UNIT-IV: PROPERTIES OF PURE SUBSTANCE 9

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

UNIT-V: GAS MIXTURES AND THERMODYNAMIC RELATIONS 9

Properties of Ideal gas, real gas - comparison. Equations of state for ideal and real gases. VanderWaal's relation - Reduced properties - Compressibility factor - Principle of Corresponding states – Generalized Compressibility Chart. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule Thomson Coefficient, Clausius Clapeyron equation.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

1. Apply the basic concepts of thermodynamic system, heat and work interaction and also can plot the PV and TS diagrams for all the processes.
2. Apply the second law of thermodynamics in analyzing the performance of thermal devices through energy and entropy calculations.
3. Apply the second law of thermodynamics to various applications and calculate the availability.
4. Evaluate the various properties of steam through steam tables and Mollier chart and understand the various properties relationship.
5. Solve the problems related to Gas Mixtures and the various property relations involved in thermodynamics.

TEXT BOOKS:

1. R.K.Rajput, “A Text Book Of Engineering Thermodynamics”, 5th Edition, 2017.
2. Nag.P.K. “Engineering Thermodynamics”, Tata McGraw-Hill, New Delhi, 6th Edition 2017.

REFERENCE BOOKS:

1. Yunus A Cengel, Michael A Boles & Mehmet Kanoglu “Thermodynamics, An Engineering Approach”, 9th edition 2019.
2. Borgnakke & Sonntag, “Fundamental of Thermodynamics”, Wiley 9th Edition, 2016.
3. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press 2nd Edition, 2016.
4. Michael J. Moran, Howard N. Shapiro, “Fundamentals of Engineering Thermodynamics”, 9th Edition.
5. Rathakrishnan, E., “Fundamentals of Engineering Thermodynamics”, 2nd Edition, Prentice Hall of India Pvt. Ltd, 2006.

E RESOURCES

https://nptel.ac.in/courses/112108148
https://nptel.ac.in/courses/112103016

CO - PO and CO - PSO MAPPING

ME3363	PROGRAM OUTCOMES												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	2	1								2				
CO2	3	3	2	1								2				
CO3	3	3	2	1					1		1	2	3		3	
CO4	3	3	2	1		1			2		1	2	3	2		
CO5	3	3	2	1		1			2		1	2	3	2	3	
Average	**3**	**3**	**2**	**1**		**0.4**			**1**		**0.6**	**2**	**1.8**	**0.8**	**1.2**	

(1-LOW. 2-MEDIUM, 3-HIGH)

ME3364	ENGINEERING METALLURGY AND MATERIAL TESTING	L	T	P	C
		3	0	0	3

OBJECTIVE:

To impart knowledge on

1. The phase structure of metals/alloys.
2. The heat treatment process employed for various materials.
3. The classification of ferrous and non ferrous alloys.
4. Practical exposure towards microstructure of Engineering Materials.
5. Mechanical testing tools for engineering materials.

UNIT-I: BINARY PHASE DIAGRAM 9

Solid solutions: Substitutional and interstitial – Compound – Phase diagram: Classification - Phase reactions with an example: Isomorphous, eutectic, eutectoid, peritectic and peritectoid, Iron – Iron carbide diagram.

UNIT-II: HEAT TREATMENT PROCESSES 9

Full, stress relief, recrystallization and spherodizing annealing – normalising, hardening and tempering of steel –phase transformation - Isothermal transformation (TTT) diagram for Eutectoid Steel – cooling curves - CCR –Hardenability - Jominy end quench test – Austempering - martempering. Case hardening - carburising, nitriding, cyaniding, carbo- nitriding, flame and induction hardening

UNIT-III: FERROUS ALLOYS 9

Classification, properties, microstructure, processing and applications of low, medium & high carbon steel & FG, SG, White, Malleable cast iron – effect of alloying elements on steel (Cr, Mo, V, Ti, Ni & W) - stainless steel and tool steels - HSLA steel & Maraging steels – Die steel, Wear of Metals - BIS Specification.

UNIT-IV: NON FERROUS ALLOYS 9

Properties, Composition, Applications: Copper and its alloys - Brass, Bronze and Cupronickel – Aluminium and its alloys – Duralumin- Bearing alloys. Nickel and Titanium base alloys – Metals for low and high temperature applications- BIS Specification.

UNIT-V: MECHANICAL TESTING AND CHARACTERIZATION 9

Mechanical properties - stress - strain curve for ferrous and non-ferrous alloys -

Mechanism of plastic deformation, slip and twinning – Fracture: types – Griffith theory - Material testing: Tensile, compression and shear loads –Hardness tests: Brinell, Rockwell and Vickers - Impact test: Izod and Charpy - Fatigue and creep tests - fracture toughness tests - Characterization techniques: Optical, SEM, XRD.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

1. Know the phase reactions of various metals and alloys.
2. Have great exposure in the heat treatment processes and know their purpose in engineering applications.
3. Have knowledge in the classification, properties and applications of various ferrous alloys.
4. Know the classification and application of various non ferrous alloy materials.
5. Identify the various mechanical properties for the ferrous and non ferrous alloys using modern testing facilities.

TEXTBOOKS:

1. Jindal. U.C “Material science and Metallurgy”, Pearson New Delhi, 2015.
2. Selvakumar N, “Engineering Metallurgy and Nanotechnology” Scitech, Publications (India) Pvt. Ltd., 2018

REFERENCE BOOKS:

1. Raghavan.V, “Materials Science and Engineering”, Prentice-Hall, 6th Edition, 2015.
2. William D Callister and David G. Rethwisch, “Material Science and Engineering: An Introduction”, John Wiley, 10th Edition, 2018.
3. Sydney H. Avner “Introduction to Physical Metallurgy”, McGraw Hill Book Company, 2nd Edition, 2017. 5. George E. Dieter, Jr, “Mechanical Metallurgy”, Create Space Independent Publishing Platform, 3rd edition, 2017
4. Raghavan.V, “Materials Science and Engineering”, Prentice-Hall, 6th Edition, 2015.

E RESOURCES :

https://nptel.ac.in/courses/112108150

https://www.digimat.in/nptel/courses/video/113107078/L01.html

CO - PO and CO - PSO MAPPING

ME3364	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	1	3	2								2	2	1	2	
CO2	3	1	3	1		2		1				2	2	1	2	
CO3	3	1	3									2	2	1	2	
CO4	3	1	3				2					2	2	1	2	
CO5	3	1	3	2	2							2	2	1	2	
Average	**3**	**1**	**3**	**1**	**0.4**	**0.4**	**0.4**	**0.2**				**2**	**2**	**1**	**2**	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3365	MANUFACTURING PROCESSES	L	T	P	C
		3	0	0	3

OBJECTIVE:

1. To understand different manufacturing processes and select the best one out of the available methods.
2. To expose the concepts to the students in various metal casting, metal joining processes.
3. To learn and understand the working principle of bulk deformation processes.
4. To understand the working principles of sheet metal forming process
5. To Apply the working principle of plastics moulding.

UNIT-I: METAL CASTING **10**

Casting terminology, hand moulding, pattern material, allowance; Pattern types: Single piece, split, gated; Core prints, moulding sand properties, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Melting furnaces: Blast and Cupola Furnaces; Principle of special casting processes: Shell - investment - Ceramic mould - Pressure die casting - Centrifugal Casting - Stir casting; Defects in Sand casting.

UNIT-II: JOINING PROCESSES **10**

Operating principle, basic equipment, merits and applications of fusion welding processes: Gas welding - Types - Flame characteristics; Manual metal arc welding - Gas Tungsten arc welding - Gas metal arc welding - Submerged arc welding - Electro slag welding; Operating principle and applications of resistance welding - Plasma arc welding - Thermit welding - Electron beam welding - Friction welding and Friction Stir Welding. brazing, soldering and adhesive bonding; Weld defects: types, causes and cure.

UNIT-III: BULK DEFORMATION PROCESSES **9**

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

UNIT-IV: SHEET METAL PROCESSES 9

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

UNIT-V: POWDER METALLURGY AND PLASTIC PROCESSING 7

Production of metal powder: Atomization, crushing; Blending; Compacting: Die pressing, iso-static pressing; Sintering: Principle, continuous sintering process; Plastic processing: Injection, Blow moulding, Rotational moulding, Film blowing and Thermoforming

TOTAL : 45 PERIODS

COURSE OUTCOMES:

The student gains knowledge about

1. Metal casting techniques
2. Various metal joining techniques
3. Various bulk deformation processes
4. Different sheet metal forming techniques
5. Manufacturing of plastic components by injection moulding, film blowing

TEXTBOOKS:

1. Serope Kalpakjian, Steven R.Schmid, “Manufacturing Engineering and Technology”, Pearson Education, Eighth Edition, 2020.
2. P.N. Rao, “Manufacturing Technology: Foundry, Forming and Welding - Volume 1”, Tata McGraw-Hill Publishing Limited, 2019.

REFERENCE BOOKS:

1. P.C. Sharma, “A text book of Production Technology (Manufacturing Processes)”, S. Chand and Company, 8th Edition 2014.
2. S.Gowri, P.Hariharan, and A.Suresh Babu, “Manufacturing Technology 1”, Pearson Education, 2020.
3. Hajra Choudhury, “Elements of Workshop Technology, Vol. I”, Media Promotors Pvt Ltd., Mumbai, 2017.
4. B.S. Nagendra Parashar& R.K. Mittal, “Elements of Manufacturing Processes”, Prentice Hall of India, 2011.

5. Beddoes.J and Bibby M.J, “Principles of Metal Manufacturing Processes”, Elsevier, 2006.
6. Rajput R.K, “A text book of Manufacturing Technology”, Lakshmi Publications, 2017.

E- RESOURCES:

1. https://nptel.ac.in/courses/112107144
2.https://archive.nptel.ac.in/courses/112/107/112107219

CO - PO and CO - PSO MAPPING

ME3365	PROGRAM OUTCOMES												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3		2			2	3	1	1			1	3	1	2	
CO2	3		2			2	3	1	1			1	3	1	2	
CO3	3		2			2	2	1	1			1	3	1	2	
CO4	3		2			2	2	1	1			1	3	1	2	
CO5	3		2		2	2	2	1	1			1	3	1	2	
Average	**3**		**2**		**2**	**2**	**2**	**1**	**1**			**1**	**3**	**1**	**2**	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3336	FLUID MECHANICS AND MACHINERY	L	T	P	C
		3	0	0	3

OBJECTIVES:

To impart knowledge to the students on the following topics of:

1. Mathematical concepts used to predict the effect of fluid properties on a flow system & the various pressure measuring devices.
2. Analysis of fluid kinematics and fluid dynamics using various mathematical equations.
3. Analysis and calculations of major and minor losses associated with pipe flow in piping networks.
4. Prediction of physical quantities.
5. Analysis of the performance of turbines and pumps.

UNIT-I FLUID PROPERTIES AND FLUID STATICS 9

Fluid – definition, Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

UNIT-II FLUID KINEMATICS AND FLUID DYNAMICS 9

Fluid Kinematics - types of flow - velocity field and acceleration - continuity equation - Equation of streamline - stream function - velocity potential function - circulation - flow net. Fluid Dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube

UNIT-III: FLOW THROUGH CIRCULAR CONDUITS 9

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli-Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation – friction factor - Moody diagram - commercial pipes- minor losses – Flow through pipes in series and parallel.

UNIT-IV: DIMENSIONAL ANALYSIS 9

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT-V: TURBINES AND PUMPS 9

Impact of jets – Hydro turbines: definition and classifications - Euler's equation for turbo machines. Turbines: definition and classifications - working principles - Impeller turbine - Reaction turbine - velocity triangles. Pumps: definition and classifications - Centrifugal pump - Reciprocating pump - velocity triangles, indicator diagram, specific speed, cavitations in pumps.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will have the:

1. Ability to apply mathematical knowledge to predict the properties and pressure measurement.
2. Ability to analyze fluid kinematics and fluid dynamics using various mathematical equations.
3. Ability to analyze and calculate major and minor losses associated with pipe flow in piping networks.
4. Ability to predict the nature of physical quantities mathematically.
5. Ability to analyze the performance of turbines and pumps.

TEXTBOOKS:

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2017.
2. Bansal R.K “A Text Book Fluid Mechanics and Hydraulic Machines”, Laxmi Publications (p) Ltd, 10th Edition, 2018.

REFERENCE BOOKS:

1. Frank M White, Fluid Mechanics” Mc Graw hill Education, 9th Edition, 2017
2. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2013
3. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016.
4. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011.
5. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2013.

E-RESOURCES:

https://nptel.ac.in/courses/112106175

https://nptel.ac.in/courses/112104117

https://nptel.ac.in/courses/112104118

CO - PO and CO - PSO MAPPING

	PROGRAM OUTCOMES												PSO's			
ME3336	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3		1								3	3		
CO2	3	3	3	1	1	2							3	3		
CO3	3	2	3	2	2								3	3		
CO4	3	3	3		2								3	3		
CO5	3	3	3		2								3	3		
Average	**3**	**2.8**	**3**	**0.6**	**1.6**	**0.4**							**3**	**3**		

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3367	MANUFACTURING TECHNOLOGY LABORATORY- I	L	T	P	C
		0	0	3	2

OBJECTIVE:

To Study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.

LIST OF EXPERIMENTS

Machining and Machining time estimations for:

1. Taper Turning operation and Machining time estimations for taper turning operation
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling operation and Machining time estimations for knurling operation
6. Square Head Shaping
7. Hexagonal Head Shaping
8. Fabrication of simple structural shapes using Gas Metal Arc Welding
9. Joining of plates and pipes using GMA / SAW welding
10. Preparation of green sand moulds
11. Manufacturing of simple sheet metal components using shearing and bending operations
12. Manufacturing of sheet metal components using metal spinning on a lathe

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

1. Manufacture the work piece as per given shape and size using lathe
2. Demonstrate the safety precautions exercised in the mechanical workshop
3. Create the work piece as per given shape and size using machining processes such as shaping, drilling and milling
4. Make sheet metal components like tray and funnel
5. Formulate the moulding, sand moulds using tools, patterns.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. NO.	NAME OF THE EQUIPMENT	QTY
1.	Centre Lathes	7 Nos
2.	Horizontal Milling Machine	1 No
3.	Vertical Milling Machine	1 No
4.	Shaper.	1 No.
5.	Arc welding transformer with cables and holders	2 Nos
6.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit	1 No
7.	Moulding table, Moulding equipment	2 Nos
8.	Sheet metal forming tools and equipment	2 Nos

CO - PO and CO - PSO MAPPING

ME3367	PROGRAM OUTCOMES												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3						1		2			1	1	2	2	
CO2	3						1		2			1	1	2	2	
CO3	3						1		2			1	1	2	2	
CO4	3						1		2			1	1	2	2	
CO5	3						1		2			1	1	2	2	
Average	**3**						**1**		**2**			**1**	**1**	**2**	**2**	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3339	FLUID MECHANICS AND MACHINERY LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

Upon Completion of this subject, the students can be able to:

1. Understand hands on experience in flow measurements using different devices.
2. Understand the working principle and performance of centrifugal and submergible pumps.
3. Know, how to calculate and draw characteristics curves for various experiments related to fluid mechanics.
4. Understand the energy flow pattern through the hydraulic turbines and pumps.
5. Explain his/her competency towards preventive maintenance of hydraulic turbines.

LIST OF EXPERIMENTS:

1. Determination of the Coefficient of discharge of given Orifice-meter.
2. Determination of the Coefficient of discharge of given Venturi-meter.
3. Calculation of the rate of flow using Rotameter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump / submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

1. Ability to use the measurement equipment for flow measurement.
2. Ability to do performance trust on different fluid machinery.

3. Conduct experiments on hydraulic turbines and pumps to draw characteristics.
4. Determine the energy flow pattern through the hydraulic turbines and pumps.
5. Exhibit his/her competency towards preventive maintenance of hydraulic turbines.

E-RESOURCES:

https://archive.nptel.ac.in/courses/112/106/112106311/

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.NO	NAME OF THE EQUIPMENT	QTY.
1	Orifice meter setup	1 no
2	Venturi meter setup	1 no
3	Rotameter setup	1 no
4	Pipe flow analysis setup	1 no
5	Centrifugal pump / Submergible pump setup	1 no
6	Reciprocating pump setup	1 no
7	Gear pump setup	1 no
8	Pelton wheel setup	1 no
9	Francis turbine setup	1 no
10	Kaplan turbine setup	1 no

CO - PO and CO - PSO MAPPING

ME3339	PROGRAM OUTCOMES												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	3	3	3	3		3	3			1	2	2	2
CO2	3	3	3	3	3	3	3		3	3				2	2	2
CO3	3	3	3	3	3	3	3		3	3				2	2	2
CO4	3	3	3	3	3	3	3		3	3			2	2	2	2
CO5	2	2	2	2	2	2	3		2	2			2	2	2	2
Average	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3.2**	**3**		**3.2**	**3.2**			**1.6**	**2**	**2**	**2**

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3339	COMPUTER AIDED DRAFTING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

1. To make the students understand and interpret drawings of Machine Components
2. To prepare assembly drawings both manually and using standard CAD packages
3. To familiarize the students with Indian Standards on drawing practices and standard components
4. To gain practical experience in handling 2D drafting and 3D modeling software systems.

UNIT-I: DRAWING STANDARDS & FITS AND TOLERANCES 9

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

UNIT-II: INTRODUCTION TO 2D DRAFTING 12

Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, and Detailed drawing. Bearings - Bush bearing, Plummer block, Valves – Safety and non-return valves.

UNIT-III: 3D GEOMETRIC MODELING AND ASSEMBLY 24

Sketcher - Datum planes – Protrusion – Holes - Part modeling – Extrusion – Revolve – Sweep – Loft – Blend – Fillet - Pattern – Chamfer - Round - Mirror – Section – Assembly Couplings – Flange, Universal, Oldham's, Muff, Gear couplings Joints – Knuckle, Gib & cotter, strap, sleeve & cotter joints Engine parts – Piston, connecting rod, cross-head (vertical and horizontal), stuffing box, multi-plate clutch, Miscellaneous machine components – Screw jack, machine vice, tail stock, chuck, nozzle, ABS rotor, vane pump and gear pump.

PERIODS

Note: 25% of assembly drawings must be done manually and the remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D / 3D CAD software.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

1. Follow the drawing standards, Fits and Tolerances
2. Re-create part drawings and sectional views
3. Make assembly drawings as per standards

TEXTBOOKS:

1. Narayana K.L., “Machine Drawing”, 6th Edition, New Age International Publishers 2019.
2. N. D. Bhatt and V.M. Panchal, “Machine Drawing”, 48th Edition, Charotar Publishers, 2013.

REFERENCE BOOKS:

1. Junnarkar, N.D., “Machine Drawing”, 1st Edition, Pearson Education, 2004
2. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, ”Machine Drawing” , published by Tata Mc GrawHill,2006
3. Gopalakrishna K.R., “Machine Drawing”, 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013

E-RESOURCES:

https://nptel.ac.in/courses/112104031

https://eeedocs.files.wordpress.com/2014/02/machinedrawing.pdf

CO - PO and CO - PSO MAPPING

ME3339	PROGRAM OUTCOMES												PSO’s			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	1		1	1	1	1			1	1			1	1		1
CO2	2		1		1	2			2	1			1	1	1	
CO3	1		2		1	1			1	1			2	1		
Average	**1.3**		**1.3**	**0.3**	**1**	**1.3**			**1.3**	**1**			**1.3**	**1**	**0.3**	**0.3**

(1–LOW, 2– MEDIUM, 3–HIGH)

MA3425	APPLIED MATHEMATICS FOR MECHANICAL ENGINEERING	L	T	P	C
		2	0	0	2

OBJECTIVE:

1. To familiarize the students with ordinary differential equations
2. To develop the use of ordinary differential equations that is needed by engineers for practical application.
3. To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems?
4. To acquaint the student with Fourier series techniques in solving one dimensional wave equations used in various situations.
5. To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.

UNIT-I ORDINARY DIFFERENTIAL EQUATIONS 6

Higher order linear differential equations with constant coefficients – Method of variation of parameters.

UNIT-II APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS - ONE DIMENSIONAL WAVE EQUATIONS 6

Classification of PDE - Solutions of one dimensional wave equation

UNIT-III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS - ONE DIMENSIONAL HEAT EQUATIONS

One dimensional equation of heat conduction- Zero to zero- Non zero to zero – Non zero to non zero boundary conditions

UNIT-IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS - TWO DIMENSIONAL HEAT EQUATIONS 6

Steady state solution of two dimensional equation of heat conduction in infinite plates (excluding insulated edges) and circular plates.

UNIT-V BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS 6

One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

1. Understand how to solve the given ordinary differential equations.

2. Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
3. Appreciate the physical significance of Fourier series techniques in solving one dimensional wave equations.
4. Appreciate the physical significance of Fourier series techniques in solving one dimensional heat flow problems.
5. Appreciate the physical significance of Fourier series techniques in solving two dimensional heat flow problems.

TEXT BOOKS

1. Veerarajan. T., “Transforms and Partial Differential Equations”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015

REFERENCE BOOKS:

1. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, 2007.
2. Erwin Kreyszig,“Advanced Engineering Mathematics”, 8th Edition, Wiley India, 2007.
3. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.

CO - PO and CO - PSO MAPPING

	PROGRAM OUTCOMES												PSO’s			
ME3425	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	2	1	1												
CO2	2	2	1	1												
CO3	2	2	1	1												
CO4	2	2	1	1												
CO5	2	2	1	1												
Average	**2**	**2**	**1**	**1**												

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3462	MANUFACTURING TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

1. Study the concepts and basic mechanics of metal cutting and the factors affecting machinability.
2. Learn working of basic and advanced turning machines.
3. Teach the basics of machine tools with reciprocating and rotating motions and abrasive finishing processes.
4. Study the basic concepts of CNC of machine tools and constructional features of CNC.
5. Learn the basics of CNC programming concepts to develop the part programme for CNC Machining.

UNIT-I: FUNDAMENTALS OF MACHINING 9

Introduction: Material removal processes, types of machine tools; Metal cutting fundamentals: Theory of chip formation, types of chips, Piispanen model of card analogy, orthogonal cutting and oblique cutting; Nomenclature of single point cutting tools; Mechanics of metal cutting: Machining forces and Merchant's Circle Diagram (MCD) – simple calculations, cutting tool materials, tool wear, tool life, surface finish, cutting fluids; Overview of high speed machining.

UNIT-II: CENTRE LATHE AND SPECIAL PURPOSE LATHES 9

Centre lathe, constructional features, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes – Automats – Single spindle, Swiss type, multi spindle - Turret Indexing mechanism, Bar feed mechanism.

UNIT-III: MACHINE TOOLS FOR NON-CIRCULAR COMPONENTS AND HOLE MAKING 9

Reciprocating machine tools: shaper, planer, slotter (Construction details only). Milling machines: Horizontal milling m/c and Vertical milling m/c: specifications, parts, milling cutters, work holding devices, operations. Hole making: Drilling, reaming, boring, tapping - sawing machine: hack saw, band saw, circular saw; broaching machines: Push, pull,

surface and continuous broaching machines – broach construction

UNIT-IV: GEAR MANUFACTURING AND SURFACE FINISHING PROCESSES **9**

Gear machining: Forming, Gear generating process – Gear shaping, Gear hobbing. Surface finishing- Abrasive processes: Types of grinding process –cylindrical grinding, surface grinding, centre less grinding – grinding wheel specifications and selection. Fine finishing processes – Honing, lapping, super finishing, polishing and buffing, power brushing-Tumbling - Metal spraying –Metallization

UNIT-V: CNC MACHINE TOOLS AND PART PROGRAMMING **9**

Numerical control (NC) machine tools - CNC: types, constructional details, special features – Design considerations of CNC machines for improving machining accuracy (Structural members, Slide ways, Linear bearings, Ball screws, Spindle drives and feed drives)- Part programming fundamentals – Manual programming – Basic NC programs (introductory programs only) - Post processors

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

1. Gain an understanding of the fundamentals of metal cutting.
2. Distinguish the process capabilities of different types of lathes.
3. Appreciate different types of reciprocating machine tools and hole-making operations.
4. Familiarize with gear manufacturing and surface finishing processes.
5. Understand the basic concepts of the Computer Numerical Control machine tool and CNC programming.

TEXTBOOKS:

1. Rao, P.N. “Manufacturing Technology”, Metal Cutting and Machine Tools, 3rd Edition Tata McGraw– Hill, New Delhi, 2018.
2. Raghuvanshi. B.S, “A course in Workshop Technology – Vol II”. 10th Revised Edition, Dhanpat Rai& Co., 2018.

REFERENCE BOOKS:

1. Hajra Choudry, “Elements of Workshop Technology: Machine Tools (Volume - 2)”, Media Promoters, 2010.
2. P.C. Sharma, “A text book of Production Technology (Manufacturing Processes) 7th Edition”, S. Chand and Company, 2009.
3. Rajput R.K, ‘A text book of Manufacturing Technology’, Lakshmi Publications, 2018.
4. Philip F.Ostwald and Jairo Munoz, ‘Manufacturing Processes and systems’, John Wiley and Sons, 9th Edition, 2008.

E-RESOURCES :

https://nptel.ac.in/courses/112105127

CO - PO and CO - PSO MAPPING

ME3462	PROGRAM OUTCOMES												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	1	1	1	3			3		2	3	3	2	
CO2	3	3	3	1	1	1	3			3		2	3	2	2	
CO3	3	3	3	1	1	1	3			3		2	3	2	2	
CO4	3	3	2	1	1	1	3			3		2	3	2	2	
CO5	3	3	3	1	1	1	3			3		2	3	2	3	
Average	3	3	2.8	1	1	1	3			3		2	3	2.2	2.2	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3463	STRENGTH OF MATERIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

1. Understand and analyze the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.
2. Analyze the transverse loading on beams and stresses in beams for various engineering applications.
3. Analyze the torsion principle for shafts and springs for various engineering applications.
4. Analyze the deflection of beams using various methods.
5. Analyze thick and thin shells.

UNIT-I: STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains –Stresses on inclined planes – principal stresses and strains and principal planes – Mohr's circle of stress.

UNIT-II: TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

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

UNIT-III: TORSION 9

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

UNIT-IV: DEFLECTION OF BEAMS 9

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

UNIT-V: THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9

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

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

1. Develop an understanding of the concepts of stress and strain and their use in the analysis of machine members.
2. Explain the concepts and procedures used in the analysis of loaded beams and shafts with various support conditions.
3. Develop an understanding of material behaviour under the condition of pure torsion (twisting moment) on circular shafts.
4. Compute slopes and deflections in determinate beams subjected to loading using various methods.
5. Analyze the stresses and deformations induced in thick and thin Shells.

TEXTBOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2017.

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

3. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2016.

REFERENCE BOOKS:

1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2002.
2. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2018.

E-RESOURCES :

https://nptel.ac.in/courses/112106141

CO - PO and CO - PSO MAPPING

	PROGRAM OUTCOMES												PSO's			
ME3463	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	3	2	3	1	3			1	3	3	2	3	
CO2	3	3	3	3	2	3	1	3			1	3	3	2	3	
CO3	3	3	3	3	2	3	1	3			1	3	3	2	3	
CO4	3	3	3	3	2	3	1	3			1	3	3	2	3	
CO5	3	3	3	3	2	3	1	3			1	3	3	2	3	
Average	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**			**1**	**3**	**3**	**2**	**3**	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3464	THEORY OF MACHINES	L	T	P	C
		3	0	0	3

OBJECTIVES:

1. Applying the basic components of mechanisms
2. Designing cam mechanisms for specified output motions.
3. Applying the basic concepts of toothed gearing and kinematics of gear trains
4. Understanding the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
5. Understanding the undesirable effects of unbalances resulting from prescribed motions in the mechanism.

UNIT-I: BASICS OF MECHANISMS 9

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.

UNIT-II: KINEMATICS OF CAM MECHANISMS 9

Classification of cams and followers–Terminology and definitions–Displacement diagrams– Uniform velocity, parabolic, simple harmonic and cycloidal motions– follower motions–Layout of plate cam profiles–Specified contour cams–Circular arc and tangent cams.

UNIT-III: GEARS AND GEAR TRAINS 9

Law of toothed gearing – Involutes and cycloidal tooth profiles – definitions–Gear tooth action–contact ratio–Interference and under cutting. Gear trains– Speed ratio, train value – Parallel axis gear trains–Epicyclic Gear Trains-Compound gear trains-reverted gear trains-cyclometer- differential gear.

UNIT-IV: FORCE ANALYSIS 9

Dynamic force analysis – Inertia force and Inertia torque– D Alembert's principle –Dynamic Analysis in reciprocating engines – Gas forces – Inertia effect of connecting rod– Bearing loads –Crank shaft torque – Turning moment diagrams –Fly Wheels.

UNIT-V: BALANCING 9

Balancing of rotating masses – Balancing of several masses rotating in same plane - Balancing of several masses rotating in different planes. Balancing of reciprocating masses – Swaying couple - Hammer blow – Partial balancing of unbalanced primary force in a reciprocating engine

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

1. Familiar with the basic components of mechanisms and implement them.
2. Create customized cam mechanisms for required particular output motions.
3. Understand the basic concept soft toothed gearing and kinematics of gear trains and bring into practicable form the concepts learned.
4. Calculate static and dynamic forces of mechanisms.
5. Work out the amount of balancing masses required and their locations of reciprocating and rotating masses.

TEXTBOOKS:

1. Dr.Khurmi R S, “Theory of Machines”, 14th edition, S Chand publications, 2020.
2. Rattan, S.S, “Theory of Machines”, 5th Edition, Tata McGraw-Hill, 2019.

REFERENCE BOOKS:

1. Allen S. HallJr., “Kinematics and Linkage Design”, Prentice Hall, 1961
2. Cleghorn.W.L, “Mechanisms of Machines”, Oxford University Press, 2014
3. Ghosh. A and Mallick, A.K., “Theory of Mechanisms and Machines", 3rd Edition Affiliated East-West Pvt.Ltd., New Delhi, 2006.
4. John Hannah and Stephens R.C.,"Mechanics of Machines", Viva Low-Prices Student Edition, 1999.
5. ThomasBevan,"TheoryofMachines",3rd Edition, CBS Publishers and Distributors, 2005.

E-RESOURCES:

https://archive.nptel.ac.in/courses/112/104/112104121/

CO - PO and CO - PSO MAPPING

ME3464	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	2		2			1				1	3		1	
CO2	3	2	2		2			1				1	3		1	
CO3	3	2	2		2			1				1	3		1	
CO4	3	2	2		2			1				1	3		1	
CO5	3	2	2		2			1				1	3		1	
Average	**3**	**2**	**2**		**2**			**1**				**1**	**3**		**1**	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3465	UNCONVENTIONAL MACHINING PROCESSES	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

1. Classify the unconventional machining processes and describe the mechanical processes.
2. Describe the thermal and electrical based process.
3. Identify the chemical and electrochemical based process parameters and their influence on performance and their applications.
4. Learn the advanced Nano finishing process.
5. Know the latest trends microfabrication technology.

UNIT-I: INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES **9**

Unconventional machining Process – Need – classification – merits, demerits and applications. 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-II: THERMAL AND ELECTRICAL ENERGY BASED PROCESSES **9**

Electric Discharge Machining (EDM) – Wire cut EDM – Working Principle-equipment-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear –Dielectric – Flushing – Applications. Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM) – Working Principles – Equipment –Types – Beam control techniques – Applications.

UNIT-III: CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES **9**

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

UNIT-IV: ADVANCED NANO FINISHING PROCESSES 9

Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magnetorheological abrasive flow finishing their working principles, equipment, the effect of process parameters, applications, advantages and limitations.

UNIT-V: MICROFABRICATION TECHNOLOGY 9

Rapid prototyping- classification of rapid prototyping techniques-steps of rapid prototyping -Stereolithography (SLA), Selective laser sintering (SLS)-Fused Deposition Modelling (FDM)- processes, working principles, advantages, disadvantages, applications, limitations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

1. Apply the different UCMP for real time applications.
2. Analyze the various thermal energy and electrical energy based UCMP.
3. Integrate the chemical and electro-chemical energy based UCMP.
4. Apply the various nano abrasives based UCMP in industries.
5. Create the devices involved in microfabrication and recent technology.

TEXTBOOKS:

1. Adithan. M., “Unconventional Machining Processes”, Atlantic, New Delhi, India, 2009. ISBN 13: 9788126910458.
2. Anand Pandey, “Modern Machining Processes”, Ane Books Pvt. Ltd., New Delhi, India,2019.

REFERENCE BOOKS:

1. Benedict. G.F. “Non-traditional Manufacturing Processes”, Marcel Dekker Inc., New York, 2010.
2. Paul DeGarmo, J.T.Black, and Ronald.A.Kohser, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd., 8thEdition, New Delhi, 2012.

3. Kapil Gupta, Neelesh K. Jain and Laubscher R.F., “Hybrid Machining Processes: Perspectives on Machining and Finishing”, 1st edition, Springer International Publishing., Switzerland, 2016.
4. Serope Kalpakjian and Steven R. Schmid- Manufacturing Process for Engineering Material – Pearson Education, 6th Edition, 2018

E- RESOURCES:

https://www.digimat.in/nptel/courses/video/112104195/L01.html

CO - PO and CO - PSO MAPPING

ME3465	PROGRAM OUTCOMES												PSO’s			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	2		3	3	1						2	2	2	
CO2	3	2	2		3	3	1						2	2	2	
CO3	3	2	2		3	3	1						2	2	2	
CO4	3	2	2		3	3	1						2	2	2	
CO5	3	2	2		3	3	1						3	3	3	
Average	**3**	**2**	**2**		**3**	**3**	**1**						**2.2**	**2.2**	**2.2**	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3466	THERMAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The main learning objective of this course is to impart knowledge on

1. Steam power cycles and their application in steam power plants.
2. Concepts of thermodynamics in different air standard cycles and to solve problems.
3. Functions and features of IC engines and to calculate the performance parameters of IC Engines.
4. Concepts of steam nozzles and turbines and to solve problems.
5. Psychrometrics and Refrigeration to solve problems.

(Use of standard refrigerant property data book, Steam Tables, Mollier diagram and Psychrometric chart permitted)

UNIT-I BASIC STEAM POWER CYCLES 9

Carnot Cycle - Rankine Cycle- Modified Rankine Cycle- Regenerative Cycle - Reheat Cycle.

UNIT-II GAS POWER CYCLES 9

Air Standard Cycles - Otto, Diesel and Dual – Calculation of mean effective pressure, and air standard efficiency Comparison of cycles

UNIT-III INTERNAL COMBUSTION ENGINES AND PERFORMANCE 9

IC engine – Classification and application IC engine - Theoretical and actual Valve timing diagrams - Port time diagram - Theoretical and actual p-V diagrams of a four-stroke Otto and Diesel cycle engine. Performance parameters and calculations.

UNIT-IV STEAM NOZZLES AND STEAM TURBINES 9

Introduction – Steam flow through nozzles – Nozzle efficiency – Classification of the steam turbine – Advantages of the steam turbine over steam engines – Methods of reducing wheel – Impulse turbine – Turbine Efficiency.

UNIT-V PSYCHROMETRICS AND REFRIGERATION 9

Concept of Psychrometry and Psychrometrics - Definitions - Psychrometric Charts - Psychrometric Processes - Fundamentals of refrigeration – Air refrigeration system – Simple vapour compression system – Vapour absorption system.

TOTA : 45 PERIODS

COURSE OUTCOMES:

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

1. Solve problems on Steam power cycles.
2. Execute thermodynamic concepts to different air standard cycles and solve problems.
3. Report the functioning and features of IC engines and performance parameters of IC Engines.
4. Solve problems in steam nozzles and turbines.
5. Solve problems in psychrometrics and Refrigeration concepts.

TEXTBOOKS:

1. Kothandaraman, C.P., “A Course in Thermal Engineering", Fifth Edition,” Dhanpat Rai and Co, 2004.
2. Rajput, R.K., “Thermal Engineering” Tenth Edition, Laxmi Publication (P) LTD, 2017.

REFERENCE BOOKS:

1. Ganesan, V. "Internal Combustion Engines", Third Edition, Tata Mcgraw-Hill 2012.
2. Ballaney, P.L. "Thermal Engineering", Khanna publishers, 24th Edition 2012.
3. Ganesan, V. "Gas Turbines" Third Edition, Tata McGraw -Hill 2017.
4. Rudramoorthy, R. "Thermal Engineering", “Tata McGraw-Hill, New Delhi, 2003.
5. Sarkar, B.K, "Thermal Engineering", Tata McGraw-Hill Publishers, 2007.

E-RESOURCE

https://onlinecourses.nptel.ac.in/noc23_me31/preview

CO - PO and CO - PSO MAPPING

ME3466	PROGRAM OUTCOMES												PSO's			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	2										1	2	1		
CO2	2	2										1	2	1		
CO3	2	2										1	2	1		
CO4	2	2										1	2	1		
CO5	2	2										1	2	1		
Average	**2**	**2**										**2**	**2**	**1**		

(1–LOW, 2– MEDIUM, 3–HIGH)

GE 3451	NCC CREDIT COURSE LEVEL - I	L T P C
	(Common to Army, Navy & Air)	3 0 0 3

OBJECTIVES:

1. To know the basic structure of NCC and Role of NCC
2. To improve the cadet's personality skill and leadership quality
3. To make the interest of cadets to involve in social activities
4. Preventing the potential damage and suffering
5. to destruction of the enemy's ability to fight and will to fight

Unit I INTRODUCTION TO NCC 9

Aims, Objectives & Organization of NCC, Incentives, Duties of NCC Cadet, NCC Camps and Types National Integration: Importance & Necessity, Factors Affecting National Integration, Unity in Diversity & Role of NCC in Nation Building, Threats to National Security.

UNIT II PERSONALITY DEVELOPMENT 9

Personal Transformation, Personal Productivity Skills - time management, organizational and planning skills, problem solving and decision-making abilities, basics of psychology, Leadership, Meditation

Unit II SOCIAL SERVICE AND COMMUNITY DEVELOPMENT 9

Basics, Rural Development Programmes, NGOs, Contribution of Youth, Protection of Children and Women Safety, Road / Rail Travel Safety, New Initiatives, Cyber and Mobile Security Awareness

Unit IV DISASTER MANAGEMENTS AND ITS AWARENESS 9

Importance of Hazards and Disaster, Types of disasters, Earthquakes and its types, flood types and its management, landside and its managements case studies of disasters in Sikkim, Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management

Unit V WAR AND PEACE IN CONTEMPORARY WORLD 9

Conceptual framework of War and Peace, Concepts of theories and approaches, Modern /war fare: Conventional, nuclear, Guerilla and Irregular Warfare, Limited and Specialized Warfare with reference to mountain, desert and jungle warfare, terrorism as a new mode

of conflict, War as an Economic Problem, Defence and Development, Defence and Development, Defence and Development, Defence and Development

TOTAL: 45 PERIODS

NOTE: NCC Credit Course Level – I is offered for NCC students only. The grades earned by the students will be recorded in the marksheet, however the same shall not be considered for the computation of CGPA

COURSE OUTCOME:

At the end of the course, the student should be able to:

1. Understand their roles and responsibilities
2. Demonstrate the knowledge of human values and morals
3. Actively participate in social service and development activities
4. Understand the importance of disaster management
5. Analyse the issues related to war and its effects.

TEXT BOOKS

1. R. Gupta's NCC Handbook of NCC Cadets 'A', 'B' and 'C' certificate Examinations

REFERENCE BOOK:

1. V. B. RAO, Personality Development and Soft Skills, BS Publications
2. Harish K. Gupta, Disaster Management, Universities press

ME3467 MANUFACTURING TECHNOLOGY LABORATORY–II

L	T	P	C
0	0	3	2

OBJECTIVES:

To study and acquire knowledge on various basic machining operations in special purpose machines and its applications in real life manufacture of components in the industry

LIST OF EXPERIMENTS:

1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Helical Gear Cutting in milling machine
4. Gear generation in hobbing machine
5. Gear generation in gear shaping machine
6. Plain Surface grinding
7. Cylindrical grinding
8. Tool angle grinding with tool and Cutter Grinder
9. Measurement of cutting forces in Milling / Turning Process
10. CNC Part Programming

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

1. Prepare the work piece as per the given shape and size using machining processes such as surface grinding, tool grinding cylindrical grinding.
2. Create the work piece as per the given shape and size using machining process such as rolling, drawing, turning, shaping, drilling and milling.
3. Manufacture the gears using gear making machines and analyze the defects in the cast and machined components.

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Turret and Capstan Lathes	1No each
2	Horizontal Milling Machine	2Nos.
3	Vertical Milling Machine	1No
4	Surface Grinding Machine	1No
5	Cylindrical Grinding Machine	1No
6	Radial Drilling Machine	1No
7	Lathe Tool Dynamometer	1No
8	Milling Tool Dynamometer	1No
9	Gear Hobbing Machine	1No
10	Tool Makers Microscope	1No
11	CNC Lathe	1No
12	CNC Milling machine	1No
13	Gear Shaping machine	1No
14	Centerless grinding machine	1No
15	Tool and cutter grinder	1No

CO - PO and CO - PSO MAPPING

ME3467	PROGRAM OUTCOMES												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3						1		2			1	1	2	2	
CO2	3						1		2			1	1	2	2	
CO3	3						1		2			1	1	2	2	
Average	**3**						**1**		**2**			**1**	**1**	**2**	**2**	

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3468	STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

1. Performing various destructive testing on metal samples.
2. Analyzing the effect of torsion on metal rods.
3. Performing various hardness tests
4. Understanding the effects of hardening on metal specimens.
5. Analyzing the effects of tempering on metal specimens.

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminum rods
3. Torsion test on a mild steel rod
4. Impact test on a metal specimen
5. Hardness test on metals - Brinnell and Rockwell Nos.
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of steels.
10. Tempering- Improvement Mechanical Properties Comparison
    - Unhardened specimen
    - Quenched Specimen
    - Quenched and tempered specimen
11. Microscopic examination of hardened samples
    - Hardened and tempered samples.

COURSE OUTCOMES:

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

1. Ability to perform various destructive testing on metal samples.
2. Analyze the effect of torsion on metal rods.
3. Ability to perform various hardness tests.
4. Ability to understand the effects of hardening on metal specimens.
5. Analyze the effects of tempering on metal specimens.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Quantity
1	Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity	1
2	Torsion Testing Machine (60 NM Capacity)	1
3	Impact Testing Machine (300 J Capacity)	1
4	Brinell Hardness Testing Machine	1
5	Rockwell Hardness Testing Machine	1
6	Spring Testing Machine for tensile and compressive loads (2500 N)	1
7	Metallurgical Microscopes	3
8	Muffle Furnace (800^0C)	1

CO - PO and CO - PSO MAPPING

	PROGRAM OUTCOMES													PSO's		
ME3468	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	1	3	3	1	1		3			2	2	2		
CO2	3	2	1	3	3	1	1		3			2	3	2		
CO3	3	2	2	3	2	1	1		3			2	3	2		
CO4	3	2	1	3	3	1	1		3			2	2	2		
CO5	3	2	1	3	3	1	1		3			2	3	2		
Average	**3**	**2**	**1.2**	**3**	**2.8**	**1**	**1**		**3**				**2.6**	**2**		

(1–LOW, 2– MEDIUM, 3–HIGH)

ME3469	THERMAL ENGINEERING LABORATORY	L	T	P	C
		0	0	3	1.5

COURSE OUTCOMES:

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

1. Recognize the components and conduct the performance test on internal combustion engines.
2. Study the performance of heat pump and exhaust gas analyzer.
3. Understanding the concepts involving in steam nozzles and steam turbines.
4. Compare the working and performance of petrol and diesel engines.
5. Estimate the various properties of lubrication oils.

LIST OF EXPERIMENTS

Engine Lab

1. Valve Timing and Port Timing Diagrams.
2. Actual p-v diagrams of IC engines
3. Performance Test on 4-stroke Diesel Engine.
4. Heat Balance Test on 4-stroke Diesel Engine.
5. Morse Test on Multicylinder Petrol Engine.
6. Retardation Test to find Frictional Power of a Diesel Engine.
7. Determination of Flash Point and Fire Point of various fuels / lubricants.
8. Determination of Viscosity – using Red Wood Viscometer.

Steam Lab

9. Study and demo of Steam Generators and Turbines.

Computerized Thermal Lab

10. Experimental analysis of Heat pump refrigeration test rig using LAB VIEW software.
11. Experimental analysis of Exhaust Emissions for Diesel Engines and Boilers using LAB VIEW software.

45 PERIODS

LIST OF EQUIPMENT

(For a batch of 30 students)

1. I.C Engine – 2 stroke and 4 stroke model. 1 set
2. Red Wood Viscometer. 1 No.
3. Apparatus for Flash and Fire Point. 1 No.
4. 4-stroke Diesel Engine with mechanical loading. 1 No.
5. 4-stroke Diesel Engine with hydraulic loading. 1 No.
6. 4-stroke Diesel Engine with electrical loading. 1 No.
7. Multi-cylinder Petrol Engine. 1 No.
8. Data Acquisition system with any one of the above engines. 1 No.
9. Steam Boiler with turbine setup. 1 No.
10. Heat pump refrigeration test rig. 1 No.
11. Exhaust gas analyzer. 1 No.

CO - PO and CO - PSO MAPPING

ME3469	PROGRAM OUTCOMES												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3		3		2	2	1					3	3		
CO2	3	3		3		2	2	1					3	3		
CO3	3	3		3		2	2	1					3	3		
CO4	3	3		3		2	2	1					3	3		
CO5	3	3		3		2	2	1					3	3		
Average	**3**	**3**		**3**		**2**	**2**	**1**					**3**	**3**		

(1–LOW, 2– MEDIUM, 3–HIGH)