Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Udumalai Road, Pollachi, Coimbatore District - 642003
Established in 1998 ♦ Approved by AICTE ♦ Affiliated to Anna University
(A DIVISION OF NIA EDUCATIONAL INSTITUTIONS)
An Autonomous Institution
Since 2011
NAAC A++ GRADE
Cycle 3 (2023-2030)
The Highest Grade

Curriculum and Syllabi

Semesters I to IV

Regulations 2023

Programme: B.E. Automobile Engineering
Curriculum and Syllabi: Semester I to IV
Recommended by Board of Studies on:
Approved by Academic Council on:

Action	**Responsibility**	**Signature of Authorized Signatory**
Designed and Developed By		
Compiled By	Office of Controller of Examination	
Approved By	Principal	

Dr. Mahalingam College of Engineering and Technology, Pollachi 642003.

(An autonomous institution approved by AICTE and affiliated to Anna University)

Department of Automobile Engineering

Vision

To offer cutting-edge technology in the broad area of automobile engineering and develop globally competitive engineers

Mission:

- To develop automobile engineering graduates for a successful career in automotive industry around the globe through effective teaching-learning and training
- To develop the capability of graduates for creating innovative products / systems to enhance the quality of life
- To inculcate in them the ability to solve societal problems through engineering and professional skills

Programme Educational Objectives (PEOs)

B.E. Automobile Engineering graduates will:

PEO1. Technical expertise: Actively apply technical and professional skills in engineering practices to face industrial challenges around the globe.

PEO2. Higher studies and research: Own their professional and personal development by continuous learning to create new knowledge.

PEO3. Ethical knowledge: Conduct themselves in a responsible, professional and ethical manner supporting sustainable economic development, which enhances the quality of life.

Programme Outcomes (POs) - Regulations 2023

On successful completion of B.E. Automobile Engineering programme, graduating students/graduates will be able to:

PO1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.

PO5. 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.

PO6. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

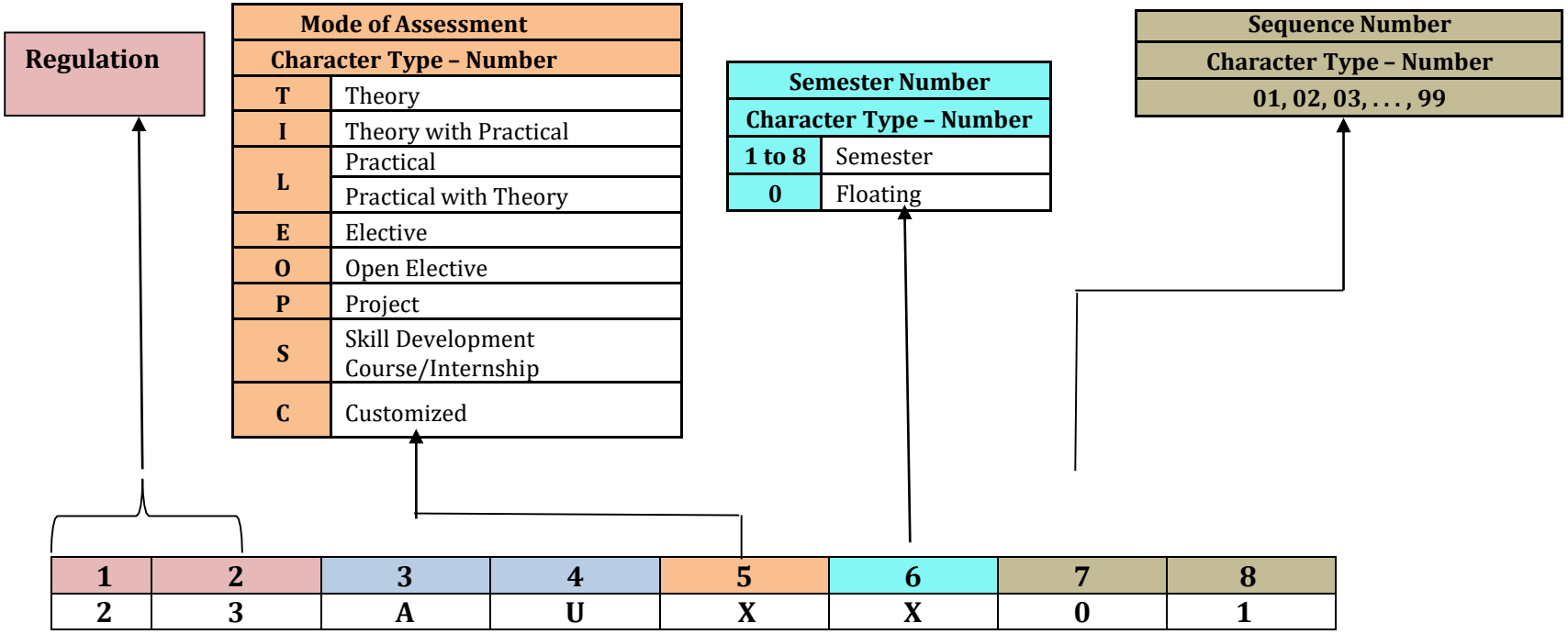
Programme Specific Outcomes (PSOs)

On successful completion of B.E. Automobile Engineering programme, graduating students/graduates will be able to:

PSO1.Analyze the systems behavior and optimize for the results using modeling, simulation and experiments.

PSO2.Design the automotive components with due considerations of environment and sustainability

Dr. Mahalingam College of Technology, Pollachi
2023 Regulations - Course Code Generation Procedure for UG Courses



Board/Department/Programme/Course Type			
Character Type – Alphabet			
AD	Artificial Intelligence & Data Science	**ME**	Mechanical
AM	CSE (Artificial Intelligence & Machine Learning)	**SC**	CSE (Cyber Security)
AU	Automobile	**PH**	Physics
CE	Civil	**CH**	Chemistry
CS	Computer Science	**EN**	English
EA	Advanced Communication Technology	**MA**	Mathematics
EC	Electronics and Communication	**ES**	Employability Skills
EE	Electrical and Electronics	**VA**	Value Added Course
EV	VLSI Design & Technology	**SA**	Studio Activities
IT	Information Technology		

Programme: B.E. Automobile Engineering
2023 Regulations (2023 Batch Only)

Course Category	Course Code	Course Title	Duration	Credits	Marks
VAC	23VAL101	Induction Program	3 Weeks	-	100

Semester I

Course Category	Course Code	CourseTitle	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI101	Communication Skills I	2	0	2	3	100	All
Minor	23MAI102	Matrices and Calculus	3	0	2	4	100	AU,EA,EC,EE,EV, ME
Minor	23PHT102	Physics for Mechanical Sciences	3	0	0	3	100	AU,ME
Multi-disciplinary	23ADT101	Python Programming for Mechanical Sciences	3	0	0	3	100	AU,ME
Major	23MEL001	Engineering Drawing	1	0	3	2.5	100	AD,AM,AU,CS,EA ,EC,EE,EV,IT,ME, SC
Minor	23PHL102	Physics for Mechanical Sciences Laboratory	0	0	3	1.5	100	AU,ME
Multi-disciplinary	23ADL101	Python Programming Laboratory for Mechanical Sciences	0	0	3	1.5	100	AU,ME
VAC	23VAL102	Wellness for Students	0	0	2	1	100	All
VAC	23VAT101	தமிழர்மரபு/ Heritage of Tamils	1	0	0	1	100	All
AEC	23SAL101	Studio Activities	0	0	2	-	-	All
		Total	**13**	**0**	**17**	**20.5**	**900**	

Semester II

Course Category	Course Code	CourseTitle	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI201/ 23FLT201/ 23FLT202	Communication Skills II/ Foreign Language-Japanese/ Foreign Language-German	2	0	2	3	100	All
Minor	23MAI202	Complex Variables and Transforms	3	0	2	4	100	AU,EC,EE,EV,ME
Minor	23CHT201	Chemistry for Mechanical Sciences	3	0	0	3	100	AU,ME
Major	23MEI201	Engineering Materials	3	0	2	4	100	AU,ME
Major	23MEL201	Computer Aided Drafting and Modelling Laboratory	1	0	3	2.5	100	AU,ME
Minor	23CHL201	Chemistry for Mechanical Sciences Laboratory	0	0	3	1.5	100	AU,ME
SEC	23MEL202	Engineering Practices Laboratory	0	0	3	1.5	100	AU,CE,ME
SEC	23ESL201	Professional Skills 1:Problem solving skills & Logical Thinking 1	0	0	2	1	100	All
VAC	23VAT201	தமிழரும்தொழில்நுட்பமும்/ Tamils and Technology	1	0	0	1	100	All
Multi-disciplinary	23CHT202	Environmental Sciences	1	0	0	-	100	All
AEC	23SAL201	Studio Activities	0	0	2	-	-	All
		Total	**14**	**0**	**19**	**21.5**	**1000**	

Programme: B.E. Automobile Engineering
2023 Regulations (2024 Batch Onwards)

Course Category	Course Code	Course Title	Duration	Credits	Marks
VAC	23VAL101	Induction Program	3 Weeks	-	100

Semester I

Course Category	Course Code	CourseTitle	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI101	Communication Skills I	2	0	2	3	100	All
Minor	23MAI102	Matrices and Calculus	3	0	2	4	100	AU,EA,EC,EE,EV, ME
Minor	23PHT102	Physics for Mechanical Sciences	3	0	0	3	100	AU,ME
Multi-disciplinary	23ADT101	Python Programming for Mechanical Sciences	3	0	0	3	100	AU,ME
Major	23MEL002	Engineering Graphics and Design	1	0	3	2.5	100	AU,ME
Minor	23PHL102	Physics for Mechanical Sciences Laboratory	0	0	3	1.5	100	AU,ME
Multi-disciplinary	23ADL101	Python Programming Laboratory for Mechanical Sciences	0	0	3	1.5	100	AU,ME
VAC	23VAL102	Wellness for Students	0	0	2	1	100	All
VAC	23VAT101	தமிழர்மரபு/ Heritage of Tamils	1	0	0	1	100	All
AEC	23SAL101	Studio Activities	0	0	2	-	-	All
		Total	**13**	**0**	**17**	**20.5**	**900**	

Semester II

Course Category	Course Code	CourseTitle	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI201/ 23FLT201/ 23FLT202	Communication Skills II/ Foreign Language Japanese/ Foreign Language-German	2	0	2	3	100	All
Minor	23MAI202	Complex Variables and Transforms	3	0	2	4	100	AU,EC,EE,EV,ME
Minor	23CHT201	Chemistry for Mechanical Sciences	3	0	0	3	100	AU,ME
Major	23MEI201	Engineering Materials	3	0	2	4	100	AU,ME
Major	23MEL201	Computer Aided Drafting and Modelling Laboratory	1	0	3	2.5	100	AU,ME
Minor	23CHL201	Chemistry for Mechanical Sciences Laboratory	0	0	3	1.5	100	AU,ME
SEC	23MEL202	Engineering Practices Laboratory	0	0	3	1.5	100	AU,CE,ME
SEC	23ESL201	Professional Skills 1: Problem solving skills & Logical Thinking 1	0	0	2	1	100	All
VAC	23VAT201	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	1	0	0	1	100	All
Multi-disciplinary	23CHT202	Environmental Sciences	1	0	0	-	100	All
AEC	23SAL201	Studio Activities	0	0	2	-	-	All
		Total	**14**	**0**	**19**	**21.5**	**1000**	

Semester III

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT302	Numerical Methods	3	1	0	4	100	AU,ME
Major	23MET301	Engineering Mechanics	2	1	0	3	100	AU,ME
Major	23AUI301	Engineering Thermodynamics and Heat Transfer	2	0	2	3	100	-
Major	23MET302	Fluid Mechanics and Hydraulics Machinery	2	1	0	3	100	AU,ME
Major	23MET303	Manufacturing Processes	3	0	0	3	100	AU,ME
Major	23MEL301	Manufacturing Processes Laboratory	0	0	3	1.5	100	AU,ME
Major	23MEL302	Fluid Mechanics and Hydraulics Machinery Laboratory	0	0	3	1.5	100	AU,ME
SEC	23ESL301	Professional Skills 2: Problem Solving Skills & Logical Thinking 2	0	0	2	1	100	All
VAC	23VAT301	Universal Human Values 2: Understanding Harmony	2	1	0	3	100	All
AEC	23SAL301	Studio Activities	0	0	2	-	-	All
SEC	23AUS301	Defensive Driving Skill Training	0	0	2	-	-	-
		Total	**14**	**3**	**14**	**23**	**900**	

Semester IV

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT401	Probability and Statistics	3	1	0	4	100	AU,ME
Major	23MET401	Strength of Materials	3	0	0	3	100	AU,ME
Major	23MET402	Mechanics of Machines	3	1	0	4	100	AU,ME
Major	23AUI401	Automotive Engines	3	0	2	4	100	-
Major	23AUT401	Automotive Chassis and Transmission	3	0	0	3	100	-
Major	23MEL401	Strength of Materials & Mechanics of Machinery Laboratory	0	0	3	1.5	100	AU,ME
Major	23AUL401	Fuels, Engine Performance and Emission Testing Laboratory	0	0	3	1.5	100	-
SEC	23ESL401	Professional Skills 3: Professional Development and Etiquette	0	0	2	1	100	All
AEC	23SAL401	Studio Activities	0	0	2	-	-	All
		Total	**15**	**2**	**12**	**22**	**800**	

Course Category	Course Code	Course Title	Duration	Credits	Marks
SEC	23XXXXXX	Internship - 1/ Community Internship/ Skill Development	2 Weeks - 4 Weeks	1	100

Tentative Curriculum for Semesters V to VIII

Semester V

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Automotive Electrical and Electronics	3	0	0	3	100	-
Major	23XXXXXX	Finite Element Analysis	2	1	0	3	100	ME, AU
Major	23XXXXXX	Design of Automotive Elements	3	1	0	4	100	-
Major	23XXXXXX	Professional Elective I	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective II	3	0	0	3	100	-
Major	23XXXXXX	Vehicle Maintenance Laboratory	0	0	3	1.5	100	-
Major	23XXXXXX	Simulation and Analysis Laboratory	0	0	3	1.5	100	ME, AU
SEC	23ESL501	Professional Skills 4: Communication Skills and Interview Essentials	0	0	2	1	100	-
Project	23XXXXXX	Reverse Engineering Project	0	0	6	3	100	-
AEC	23SAL501	Studio Activities	0	0	2	-	-	All
		Total	**14**	**2**	**16**	**23**	**900**	

Semester VI

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23XXXXXX	Mechanics of Road Vehicles	3	0	0	3	100	-
Major	23XXXXXX	Vehicle Dynamics	3	1	0	4	100	-
Major	23XXXXXX	Automotive Embedded Systems	2	0	2	4	100	-
Major	23XXXXXX	Professional Elective - III	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective - IV	3	0	0	3	100	-
Minor	23XXXXXX	Open Elective - I	3	0	0	3	100	-
Major	23XXXXXX	Automotive Embedded System Laboratory	0	0	3	1.5	100	-
SEC	23ESL601	Professional Skills 5: Campus to Corporate	0	0	2	1	100	-
AEC	23SAL601	Studio Activities	0	0	2	1	-	All
		Total	**17**	**1**	**9**	**23.5**	**800**	

Course Category	Course Code	Course Title	Duration	Credits	Marks
SEC	23XXXXXX	Internship - 2/ Research Internship/ Skill Development	2 Weeks - 4 Weeks	1	100

Semester VII

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23XXXXXX	Electric, Hybrid and Fuel cell Vehicles	3	0	0	3	100	-
Multi-disciplinary	23XXXXXX	Artificial Intelligence and Machine Learning	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective - V	3	0	0	3	100	-
Major	23XXXXXX	Professional Elective - VI	3	0	0	3	100	-
Minor	23XXXXXX	Open Elective - II	3	0	0	3	100	-
Project	23XXXXXX	Project Phase - I	0	0	8	4	200	-
		Total	**15**	**0**	**8**	**19**	**700**	

Semester VIII

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Project	23XXXXXX	Project Phase - II	0	0	12	6	200	-
SEC	23XXXXXX	Internship - 3/ Skill Development	8 Weeks			4	100	-
		Total	**0**	**0**	**12**	**10**	**300**	

Total Credits – 164.5

SEMESTER 1

Course Code:23VAL101		Course Title: Induction Program (Common to all B.E/B.Tech Programmes)
Course Category: VAC		Course Level: Introductory
Duration: 3 weeks	Mandatory Non-Credit Course	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus
3. Explain the opportunity available for professional development
4. Build universal human values and bonding amongst all the inmates of the campus and the society.

List of Activities:

1. History of Institution and Management: Overview on NIA Educational Institutions – Growth of MCET – Examination Process –OBE Practices –Code of Conduct – Centre of Excellence.
2. Lectures, interaction sessions and Motivational Talks by Eminent people, Alumni, Employer and Industry Experts
3. Familiarisation of Department / Branch:HoD's & Senior Interaction- Department Associatio
4. Universal Human Value Modules : Aspirations and concerns, Self Management, Relations Social and Natural Environment.
5. Orientation on Professional Skills Courses
6. Proficiency Modules : Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cells, Clubs and its events
8. Creative Arts : Painting, Music and Dance
9. Physical Activity :Games, Sports and Yoga
10. Group Visits: Visit to local area and Campus Tour

Course Outcomes	Cognitive Leve
At the end of this course, students will be able to:	
CO1 : Explain various sources available to meet the needs of self, such as personal items and learning resources through visit to local areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co-curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1(	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	2	-	-	-	-	-	-	2	1	2	-	-	-	-

High : 3, Medium :2, Low: 1

Text Book(s):

T1. Reading material, Workbook prepared by PS team of the college

Reference Book(s):

R1. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster Uk, 2004.

R2. Vethathiri Maharishi Institute For Spiritual and Intuitional Education, aliyar, “value educat harmonious life (Manavalakalai Yoga)”, Vethathri Publications, Erode, 2010.

R3. Dr.R.Nagarathna, Dr.H.R. Nagendra, “ Integrated approach of yoga therapy for positive Swami Vivekananada Yoga Prakashana Bangalore,2008 Ed.

Web References:

1. https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV
2. https://www.youtube.com/watch?v=P4vjfEVk&list=PLWDeKF97v9SO0frdgmpaghDMjkom1
3. https://fdp-si.aicte-india.org/download/AboutSIP/About%20SIP.pdf

Course Code: 23ENI101	Course Title: Communication Skills I (Common to all B.E/B.Tech Programmes)		
Course Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total Contact Hours:60	Max Marks:100

Course Objectives

The course is intended to impart formal and informal language effectively and accurately in various real-life contexts on par with B1 level of CEFR Scale.

Module I **20 Hours**

Grammar: Synonyms & Antonyms -Tense forms - Modals - Passives – Reported Speech – Comparatives and Descriptive adjectives.

Listening: Listening for gist and specific information - Listening to past events, experiences and job preferences - Listening to descriptions of monuments - Listening for excuses - Listening to description: transportation systems and public places.

Speaking: Introducing oneself - Exchanging personal information – Effective Conversations: Role Play Situations (Describing personality traits - Describing landmarks, monuments and festivals - Making polite requests and excuses - Discussing facts - Asking for and giving information – Expressing wishes - Talking about lifestyle changes - Talking about transportation and its problems - Describing positive and negative features of things and places - Making comparisons)

Reading: Skimming and Scanning - Reading Comprehension - Reading and comprehending online posts and emails – Case Studies

Writing: Letter writing (Permission letters - Online cover letter for job applications) - Instructions - Recommendations - Write a blog (General) - Report Writing (Industrial Visit Report and Event Reports) - formal and informal emails.

Module II **20 Hours**

Grammar: Sequence adverbs - Phrasal verbs - Relative clauses – Imperatives - Infinitives - Conditionals.

Listening: Listening to review of food items - Listening to results of surveys- Listening to motivational talks & podcasts

Speaking: Expressing likes and dislikes - Describing a favourite snack - Giving advices and suggestions - Speculating about past and future Events – Group Discussion

Reading: Reading different expository texts - Reading to factual texts - Print and online media- Reading Comprehension

Writing: Process Descriptions – Email Writing (Requesting for information) - Reviewing Movie – Social media feeds/posts (Any Social Media)

List of Experiments: **20 Hours**

1. Mini Presentation and Picture Prompt Discussion
2. Debate Tournament
3. Listening, Mind Mapping & Summarization
4. Listening to Stories and Providing the Innovative Climax
5. Reading Comprehension
6. Writing - Interpretation of Visuals

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1 : Utilize the basic English grammar and vocabulary to acquire professional communication skills.	Apply
CO 2 : Develop listening and speaking skills through classroom activities based on listening comprehension, recapitulation, interpretation and debate on the same	Apply
CO 3 : Read and write social media posts and comments	Apply
CO 4 : Perform as a member of a team and engage in individual presentation	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Textbooks:

T1. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s book 2”, 5th Edition, Cambridge University Press, South Asia Edition, 2022.

T2. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s Book 1”, 5th Edition, Cambridge University Press, South Asia Edition, 2022.

Reference Book(s):

R1. David Bohlke, Jack C. Richards, “Four Corners”, 2nd Edition, Cambridge University Press,2018.

R2. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Graham Burton,Empower B1 – Student’s Book, Cambridge University Press, 2020.

R3. Raymond Murphy, “Intermediate English Grammar” 30th Edition, Cambridge University Press,2022.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaskill/

Course Code: 23MAI102		Course Title: Matrices and Calculus (Common to AU, EA, EC, EE, EV & ME)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3:0 :2	Credits: 4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on the use of matrix algebra techniques for practical applications, familiarize with differential calculus and acquire knowledge of mathematical tools to evaluate multiple integrals.

Module I **23 Hours**

Matrices

Definitions and examples of symmetric, skew symmetric and orthogonal matrices - Eigenvalues and Eigenvectors – Properties of Eigenvalues and Eigenvectors-Diagonalization of matrices through orthogonal transformation - Cayley-Hamilton Theorem (without proof) – verification problems and properties - Transformation of quadratic forms to canonical forms through orthogonal transformation.

Differential and Integral Calculus

Curvature – Radius of curvature –Centre of curvature- Circle of curvature - Evolutes and Involutes - Evaluation of definite and improper integrals - Beta and Gamma functions – Properties and applications.

Multivariable Differentiation I

Limit – continuity - Mean value theorems and partial derivatives - Taylor's series and Maclaurin's series – Jacobian of functions of several variables.

Module II **22 Hours**

Multivariable Differentiation II

Maxima, Minima and saddle points of functions of several variables - Method of Lagrange's multipliers.

Multiple Integral

Multiple Integration: Double integrals - Change of order of integration in double integrals - Change of variables (Cartesian to polar, Cartesian to spherical and Cartesian to cylindrical) - Triple integrals - Applications: Finding areas and volumes.

Ordinary Differential Equations Of Second and Higher Orders

Second and higher order linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients (Cauchy - Euler equation, Legendre's equation) – Method of variation of parameters – Solution of first order simultaneous linear ordinary differential equations

List of Experiments: **30 Hours**

1. Introduction to MATLAB.
2. Rank of matrix and solution of system of linear algebraic equations.
3. Finding Eigen values and Eigen vectors of a matrix.
4. Solving ordinary differential equation.
5. Gram Schmidt Procedure.
6. Finding Maxima, Minima of a function.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Determine the canonical form of a quadratic form using orthogonal transformation.	Apply
CO2: Identify the evolute of a curve and solve the improper integrals using beta gamma functions.	Apply
CO3: Examine the extreme value of multivariate functions.	Apply
CO4: Evaluate the area and volume using multiple integrals and solve the higher order differential equations.	Apply
CO5: Demonstrate the understanding of calculus concepts through modern tools.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwinkreyzig, Advanced Engineering Mathematics, 9th edition, John Wiley& Sons, 2006.

T2. Veerarajan T., Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill,

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2002.

R2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112
2. https://nptel.ac.in/courses/111104031

Course Code: 23PHT102		Course Title: Physics for Mechanical Sciences (Common to AU & ME)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to develop capacity to predict the effect of force and motion in the design functions of engineering and to impart knowledge on the fundamental concepts of heat transfer and applications of laws of thermodynamics.

Module I **22 Hours**

Basics of Mechanics: Classification of mechanics, Review of fundamental laws of mechanics – Physical quantities – scalars, vectors – Newton's law of mechanics, Gravitational law. Particles and rigid body, Resolution of forces in to components, Rectangular components of forces,-Free body diagram-principle of transmissibility-Resultant force-equilibrium conditions-equilibrium of particles subjected to coplanar and non-coplanar force system – equilibrium of particles subjected to coplanar system of forces - Triangle law, Parallelogram law and Lami's theorem.

Kinematics and Kinetics of Particles: Kinematic parameters – displacement, velocity, acceleration and time. Types of motion – uniform, non-uniform motion, motion of particles in a plane – Rectinlear and curvilinear motion of particles – motion of projectile. Kinetics of particles – Force and acceleration - D'Alembert's principle – Work energy, and impulse momentum method.

Elasticity: Introduction – Concept of Load, Stress and Strain – Hooke's law – Stress-Strain Diagram – Elastic and Plastic Materials – Factors affecting Elastic Properties – Three Moduli of Elasticity – Relation between Young's, Rigidity and Bulk moduli (Qualitative – No derivation) – Bending Moment of a Beam – Determination of Young's modulus using a Cantilever – Twisting Couple of a wire – Determination of Rigidity Modulus of a thin wire using Torsional Pendulum.

Module II **23 Hours**

Viscosity: Coefficient of Viscosity – Experimental determination of coefficient of viscosity: Poiseuille's method and Stoke's method.

Thermal Physics: Introduction – Modes of Heat Transfer – Thermal Conductivity – Newton's law of cooling – Specific Heat Capacity determination – Advantages and disadvantages of Newton's law of cooling method – Verification of Newton's law of cooling – Lee's disc method for the determination of thermal conductivity of a bad

conductor – Conduction of Heat through a compound media : Bodies in both series and Parallel.

Elements of Thermodynamics: Concept of temperature – heat – thermodynamics – work – heat in thermodynamics – comparison of heat and work – internal energy – first law of thermodynamics – applications of the first law– limitations of first law, second law of thermodynamics-Statements of second law – the Carnot cycle – heat engine – heat pump – refrigerators – third law of thermodynamics.

Course Outcomes	**Cognitive Level**
At the end of the course students will able to	
CO1: **Apply** the basic concepts of mechanics and elastic properties of matter to solve the physical characteristics of an object using analytical problems.	Apply
CO2: Perform as a member of team in **analyzing** the recent advancements of mechanical engineering related to the concepts of basic mechanics, elasticity and make a presentation.	Apply
CO3: **Interpret** the concepts of viscosity, heat and thermodynamics and apply it for different real life applications.	Apply
CO4: Perform as a member of team in **articulating** the modern technologies behind the flow of fluids and different thermodynamic systems.	Apply

Course Articulation Matrix

CO Vs PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3								1	3				
CO3	3													
CO4	3								1	3				

High-3; Medium-2; Low-1

Text Book(s):

T1. R. C. Hibbeller, “Engineering Mechanics: Combined Static and Dynamics”, Prentice Hall, 2010.

T2. M.N.Avadhanulu and P.G.Kshirsagar, “Text Book of Engineering Physics”, S. Chand & Company Ltd., New Delhi, 2018.

Reference Book(s):

R1. Balasubramaniam "Callister's Material Science and Engineering", John Wiley and Sons Inc., 2nd Edition, 2015.

R2. Yunus A Sengel, Michel A Boles, Thermodynamics: An Engineering Approach, MCGraw Hill, 9th Edition, 2017.

R3. P.K.Nag, Engineering Thermodynamics, MCGraw Hill, 6th Edition, 2017.

Web References:

1. http://www.physicsclassroom.com/class/thermal.
2. https://nptel.ac.in/courses/112105123
3. https://nptel.ac.in/courses/112106286

Course Code: 23ADT101		Course Title: Python Programming for Mechanical Sciences (Common to AU & ME)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to provide the basic knowledge of Python. The course imparts the fundamentals concepts of python for writing the simple application.

Module I **22 Hours**

Computational Thinking and Problem Solving: Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions) - notation (pseudo code, flow chart, programming language) - algorithmic problem solving - simple strategies for developing algorithms (iteration, recursion).

Data Types, Expressions, Statements: Python interpreter and interactive mode, debugging-values and data types –int, float, boolean, string and list – variables – expressions – statements – tuple assignment – precedence of operators – comments

Control Flow : Conditionals: Boolean values and operators – conditional (if) – alternative (if-else) – chained conditional (if-elif-else) – Iteration: state, while, for, break, continue, pass

Module II **23 Hours**

Functions and Strings: Fruitful functions: return values – parameters – local and global scope – function composition – recursion – Strings: string slices – immutability – string functions and methods – string module– Lists as arrays

Lists, Tuples, Dictionaries: Lists: list operations – list slices – list methods – list loop – mutability – aliasing – cloning lists – list parameters –Tuples: tuple assignment – tuple as return value – Dictionaries: operations and methods – advanced list processing - list comprehension

Files, Modules, Packages: Files and exception: text files – reading and writing files – format operator – command line arguments – errors and exceptions – handling exceptions – modules – packages

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop algorithmic solutions to simple computational problems including read, write and execute the simple python programs	Apply
CO2: Apply Python programming effectively, using variables, data types, functions, recursion, and file handling to solve practical problems and build functional applications	Apply
CO3: Decompose a python program into functions for reusability and easy debugging	Apply
CO 4: Represent compound data using python lists, tuples, dictionaries	Apply
CO 5: Manipulate the data from/to files in python programs.	Apply
CO 6: Utilize built-in packages for developing simple python application	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	-	-	3	3	-	3	3

High-3; Medium-2;Low-1

Text Book(s):

T1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.

T2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016

T3. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2”, Network Theory Ltd., 2011.

Reference Book(s):

R1. John V Guttag, “Introduction to Computation and Programming Using Python”, Revised and expanded Edition, MIT Press , 2013

R2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Interdisciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.

Web References:

1. https://www.w3schools.com/python/
2. https://realpython.com/
3. https://nptel.ac.in/courses/106106145

Course Code: 23MEL001		**Course Title: Engineering Drawing** **(2023 batch only)** (Common to AD,AM,AU,CS,EA ,EC,EE,EV,IT,ME, SC)	
Course Category: Major		**Course Level: Introductory**	
L:T:P(Hours/Week) 1: 0: 3	**Credits:2.5**	**Total Contact Hours: 60**	**Max Marks:100**

Course Objectives:

The course is intended to

- To impart knowledge on basic dimensioning. 2D and 3 D drawings such as points, lines, planes and solids on first quadrant.

Module I **8 Hours**

Basics of Engineering Drawing: Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Basic Geometrical constructions –Orthographic projection- Free hand Sketching.

Projection of Points, Lines: First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces by rotating object method.

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

Module II **7 Hours**

Sectioned Solids: Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other – Orthographic views of sections of simple solids.

Development of Surfaces: Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders using straight line and radial line method.

Isometric Projection: Principles of isometric projection – Isometric scale –Isometric projections of simple solids and truncated solids. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination).

List of Experiments **45 Hours**

1. Lettering & Dimensioning
2. Projection of Points & Lines
3. Orthographic projections
4. Projection of Simple Solids
5. Projection of Section of Simple Solids
6. Development of Surfaces
7. Isometric Projections

Course Outcomes:

CO 1: Apply the concepts related to free hand sketching, orthographic and Isometric projection in first quadrant.	Understand
CO2: Apply the concepts and draw projections of points in four different quadrants and lines located first quadrant.	Apply
CO3: Apply the concepts and draw projections and sections of simple solids using rotatingobject method.	Apply
CO4: Apply the concepts and draw lateral surface of simple solids using straight line andradial line development methods.	Apply
CO5: Apply the concepts and draw isometric view of simple solids and truncated solids using principles of isometric projection.	Apply
CO6: Conduct experiments to demonstrate concepts, implement and analyze the drawing concepts using engineering tool : Using AutoCAD.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	3	-	-	3	-	-	-	1	1	-	1	-	-

High-3; Medium-2; Low-1

Textbook:

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", Tata McGraw Hill India, New Delhi, 3rd edition, 2019.

Reference Book(s):

R1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill India, New Delhi, 2nd edition, 2014.

R2. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw India, New Delhi, 3rd edition, 2010.

R3. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, Gujarat, 54rd edition, 2023.

PUBLICATIONS OF BUREAU OF INDIAN STANDARDS

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

Web References:

1 http://nptel.ac.in/courses/112103019/

2 https://www.coursera.org/specializations/autodesk-cad-cam-cae-mechanical-engineering

Course Code:23MEL002	Course Title: **Engineering Graphics and Design** (Common to all programs)		
Course Category: Major	**Course Level: Introductory**		
L:T:P(Hours/Week) : 1: 0: 3	**Credits: 2.5**	**Total Contact Hours: 60**	**Max Marks: 100**

Course Objectives:

The course is intended to impart knowledge and skills on creating 2D and 3D objects using CAD tool.

Module I **20 Hours**

Basics of Engineering Graphics: Importance of graphics in engineering applications – BIS conventions and specifications – Standards and symbols. Basic Geometrical constructions – principles of projections – free hand sketching Isometric to Orthographic and Orthographic to Isometric.

Introduction to data collaboration and management: Account creation and verification, Tool overview, and navigation to user interface- data storage, open, close, and saving a file. Import, and export project files, navigation through workspaces, data collaboration and customizing of the tool bars.

Introduction to modeling: Create a new project, create and edit a sketch; create and edit a 3D model.

Introduction to parametric sketching: Create parameter-based sketches, Sketch splines and slots, Sketch text.

Module II **10 Hours**

Introduction to parametric modeling Create a 3D mechanical link, add sketch Canvas images, Create 3D model solid trigger, Manage physical materials and appearances.

Introduction to Assembly modelling: Create a component Create a joint, Edit a joint limit, Drive a joint.

Introduction to technical drawing: Explode a 3D model for a drawing, create a drawing sheet and views, Add geometry and dimensions to a drawing, Add text and symbols, Place an exploded view, Edit a title block.

Introduction to rendering: Set up a render scene, Set up a render appearances, Create rendered images and turntable animations.

Electronics design: Copy and manage an electronics library, Create a new electronics design schematic, Create an electronics layout, Generate 3D models and gerber files. (Electrical CAD)

Practice on drafting tool: **30 Hours**

Projects

1. Create a 3D model of a wallet
2. Create a 3D model of a storage bin
3. Create a 3D model of a water pump impeller
4. Create a printed circuit board design with connectors, transistors, voltage regulator, and an LED. (Electrical CAD)
5. Model a simple coffee table with a rectangular top and four legs (Civil)
6. Model a chair with a curved backrest and seat (Civil)
7. Model a truss bridge, focusing on the arrangement of the trusses and the connections between them (Civil)

Course Outcomes:

CO1: Apply the concepts related to free hand sketching, orthographic and Isometric projection in first quadrant.	Apply
CO2: Apply the concept of CAD to create 2D and 3D models	Apply
CO3: Create 3D model and print using a 3D printer.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-

Textbook(s):

T1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, Gujarat, 54rd edition, 2023.

T2. Autodesk Fusion 360 Black Book (V 2.0.15293) – Part 1 by Gaurav Verma and Matt Weber

Reference Book(s):

R1. Autodesk Fusion 360 Black Book (V 2.0.12670) – Part 2 by Gaurav Verma and Matt Weber.

R2. Autodesk Fusion 360 – The Master Guide by Samar Malik.

R3. Parametric Modeling with Autodesk Fusion 360 by Randy H. Shih.

R4. AUTODESK FUSION 360 EXERCISES: 200 Practice drawings for Fusion 360 by Sachidanand Jha.

R5. Autodesk Fusion 360: A Tutorial Approach – 2nd edition by Prof. Sham Tickoo , Purdue University, Northwest , USA

Learning online resources:

1. Introduction to 3D Modeling for Manufacturing: https://www.autodesk.com/learn/ondemand/course/fusion360-intro-to-3d-modeling-associate.

2. Rendering: https://www.autodesk.com/learn/ondemand/module/fusion-rendering

3. Assembly modeling: https://www.autodesk.com/learn/ondemand/module/fusion-assembly-modeling

4. **Electronics Design :** Electronics design | Autodesk

Course Code: 23PHL102		Course Title: Physics for Mechanical Sciences Laboratory (Common to AU & ME)	
Course Category: Minor		Course Level: Introductory	
L:T:P (Hours/Week) 0:0:3	Credits: 1.5	Total Contact Hours: 45	Max Marks: 100

Course Objectives

The course is intended to expose the students to various experimental skills which is very essential for an Engineering student.

List of Experiments (Any ten):

1. Verify Lami's theorem using triangle law of forces.
2. Verify the parallelogram law of forces.
3. Determination of Young's modulus of the Material – Cantilever bending method.
4. Determination of Young's modulus of the Material – Uniform bending method.
5. Determination of Young's Modulus of the material – Non-Uniform bending method.
6. Determination of Rigidity modulus of the metallic wire – Torsion Pendulum.
7. Determination of viscosity of low viscous liquid – Poiseuille's method.
8. Determination of viscosity of high viscous liquid – Stoke's method.
9. Determination of thermal conductivity of the bad conductor – Lee's Disc method.
10. Determination of specific heat capacity of the given liquid – Newton's law of cooling method.
11. Determination of velocity of ultrasonic waves and compressibility of the given liquid – Ultrasonic interferometer.
12. Determination of Wavelength of laser using plane transmission grating and hence estimate particle size of lycopodium powder.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Elucidate the basic principles involved in the given experiments	Understand
CO2: Conduct, analyze and interpret the data and results from physics experiment	Evaluate

Course Articulation Matrix

CO Vs PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	3	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. Physics Laboratory Manual Prepared by Faculty of Physics, Dr. Mahalingam College of Engineering and Technology

R2. Engineering Physics Laboratory Manual, Dr. R. Jayaraman, V. Umadevi, S. Maruthamuthu, B. Saravanakumar, Pearson India Education Services Pvt. Ltd, 2022.

R3. B.Sc., Practical Physics, C.L. Arora, S. Chand and Co, 2012.

Web References:

1. https://archive.nptel.ac.in/courses/115/105/115105110/
2. https://vlab.amrita.edu/index.php?sub=1&brch=280
3. https://vlab.amrita.edu/index.php?sub=1&brch=194

Course Code:23ADL101	Course Title: Python Programming Laboratory for Mechanical Sciences (Common to AU & ME)		
Course Category: Multi-displicinary		Course Level: Introductory	
L:T:P (Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives

The course is intended to impart the programming knowledge. This will enable the students to develop simple applications in Python.

List of Experiments:

1. Draw the flowchart and algorithm for finding the weight of a steel bar for the given cross section, length and density of the material
2. Implement programs using data types, operators and expressions
3. Implement programs using branching statements
4. Implement programs using looping statements to form a pyramid pattern
5. Develop programs with all the list/tuple operations for the given list/ tuples
6. Develop a dictionary consisting of auto components and apply the dictionary operations
7. Implement program to find the factorial of the given number using function
8. Implement program for string operations.
9. Develop the program to count the number of words and characters in the given TXT file using file handling methods.
10. Implement the program to plot the components of a given force for the different angle ranges.

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Construct the flowchart and algorithm for any given scenario	Apply
CO2: Develop programs using branching and looping statements for simple business logic	Apply
CO3: Apply advanced data structure techniques in Python, utilizing functions, methods, and operators to efficiently manipulate lists, tuples, sets, dictionaries, and strings for various computational tasks	Apply
CO4: Employ the Matplotlib library function for data visualization, enabling to present data and to get insights of visual impactful method on data	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	3	-	-	-
CO4	-	-	-	3	-	-	-	-	3	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.

T2. Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python”,3rd Edition, O’Reilly, 2016.

T3. Mark Lutz, “Powerful Object Oriented Programming Python”, 4th Edition, O’Reilly, 2012.

Reference Book(s):

R1. Mark Lutz, “Learning Python, Powerful OOPs”, 5th Edition, O’Reilly, 2013.

R2. Zelle, John M, “Python Programming: An Introduction to Computer Science”, Franklin Beedle& Associates, 2003.

Web References

1. https://docs.python.org/3/tutorial/
2. https://www.learnpython.org/
3. https://www.pyschools.com/

Course Code: 23VAL102		Course Title: Wellness for Students (Common to all B.E/B.Tech Programmes)	
Course Category: VAC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0 :2	Credits:1	Total Contact Hours:30	Max Marks:100

Course Objectives:
The course is intended to impart knowledge on setting SMART goals for academic, career and life, applying time management techniques, articulating the importance of wellness for success in life and understanding the dimensions of wellbeing and relevant practices.

Module I **15 Hours**

GOAL SETTING Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

TIME MANAGEMENT - TOOLS AND TECHNIQUES Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination.

CONCEPT OF WELLNESS – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods

Module II **15 Hours**

Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

PRACTICES FOR MENTAL WELLNESS

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.
Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas.

PUTTING INTO PRACTICE
Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Set well-articulated goals for academics, career, and personal aspirations	Apply
CO 2: Apply time management techniques to complete planned tasks on time	Apply
CO 3: Explain the concept of wellness and its importance to be successful in career and life	Apply
CO 4: Explain the dimensions of wellness and practices that can promote wellness	Apply
CO 5: Demonstrate the practices that can promote wellness	Valuing

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	1	-	1
CO2	-	-	-	-	-	-	-	-	1	-	1	1
CO3	-	-	-	-	-	-	-	-	1	-	-	1
CO4	-	-	-	-	-	-	-	-	1	-	-	1
CO5	-	-	-	-	-	1	1	-	1	-	-	1

High-3; Medium-2;Low-1

Text Book(s):

T1. Reading material, workbook and journal prepared by PS team of the college

Reference Book(s):

R1. Stephen R Covey, “First things first”, Simon & Schuster UK, Aug 1997

R2. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster UK, 2004.

R3. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, “Value education for harmonious life (Manavalakalai Yoga)”, Vethathiri Publications, Erode, I Ed. (2010).

R4. Dr. R. Nagarathna, Dr. H.R. Nagendra, “Integrated approach of yoga therapy for positive health”, Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R5. Tony Buzan, Harper Collins, “The Power of Physical Intelligence English”

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்ள இயலும்.

CO.2இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்ள இயலும்.

தமிழர் மரபு

அலகு 1 – 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 கருத்துக்கள் – 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 2 – மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு 3 – நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4 – தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக் கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5 – இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறபகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள்– தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
மாணவர்கள் இப்பாடத்தை கற்றபின்	
CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

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 சங்க கால 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) (Published by: The Author)

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

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

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.
2. Understand the Contribution of Tamils to Indian National Movement and Indian Culture.

HERITAGE OF TAMILS

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

UNIT III FOLK AND MARTIAL ARTS **3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, 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 - 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

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.	Understand
CO.2 Understand the Contribution of Tamils to Indian National Movement and Indian Culture.	Understand

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

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 சங்க கால 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) (Published by: The Author)

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

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

SEMESTER 2

Course Code: 23ENI201		Course Title: Communication Skills II (Common to all B.E/B.Tech Programmes)	
Course Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total ContactHours:60	Max Marks:100

Course Objectives

The course is intended to impart effective and accurate language in business correspondence on par with B2 level of CEFR Scale.

20 Hours

Module I

Grammar: Linking Words - Collocations –Sentence Completion - Articles –Adverbs– Indefinite Pronoun

Listening: Listening to short conversations - Listening for gist and summarizing - Listening for detail - Responding to straightforward questions.

Speaking: Making statements of facts - Agreeing and disagreeing to opinions - Respond to queries - Group Discussion.

Reading: Read and select (phrasal verbs & relative clause)- Cloze Test - Gapped sentences - Multiple- choice gap-fill

Writing: Paragraph Writing: Descriptive, narrative, persuasive and argumentative - Emails: Giving information - Making enquiries - Responding to enquiries - Power Point Presentation

Module II **20 Hours**

Grammar: Expressions of cause and result – Concord - Error Spotting (Parts of Speech & Indian English) - Prepositions

Listening: Listening for identifying main points - Responding to a range of questions about different topics - Listening to identify relevant information

Speaking: Empathetic Enunciation – Situation handling – Visual Interpretation - - Short presentations

Reading: Intensive Reading: Comprehending business articles, reports and proposals and company websites-- Open gap-fill - Extended reading

Writing: – Report Writing - Memo – Complaint letter - Business Letters (Seeking permission & Providing Information)

List of Experiments: **20 Hours**

1. Listening to Monologue and Extended Listening Activity I
2. Listening to Monologue and Extended Listening Activity II
3. Expressing Opinions and Situational based speaking
4. Mini Presentation and Visual Interpretation
5. Reading Comprehension
6. Writing letter, email and report

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the common errors in written and spoken correspondence.	Apply
CO2: Develop listening, reading and speaking skills through task based activities in listening, reading comprehension, recapitulation, interpretation and discussion.	Apply
CO3: Read business correspondences like memo, Email, letter, proposals and write reports and website entries and product launches.	Apply
CO4: Perform as an individual and member of a team and engage effectively in group discussion and individual presentation.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Textbooks:

T1. Guy Brook- Hart, "Business Benchmark Upper Intermediate", 2nd Edition, South Asian, Cambridge University Press, 2020.

T2. Norman Whitby, "Business Benchmark pre-intermediate to Intermediate", 2nd Edition, South Asian, Cambridge University Press, 2014.

Reference Book(s):

R1. Hewings Martin - Advanced Grammar in use Upper-intermediate Proficiency, CUP,3rd Edition,2013.

R2. Clark David – Essential BULATS (Business Language Testing Service), CUP, 2006.

R3. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Rachel Godfrey,Gareth Davies, Empower B1+ – Student's Book, Cambridge University Press,2015.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaskill/

Course Code:23FLT201		Course Title: FOREIGN LANGUAGE -JAPANESE (Common to all B.E/B.Tech Programmes)	
Course Category: AES		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course objectives intended to:

1. Express a basic exposure on Japanese language and culture
2. Express thoughts and communicate in the beginner level of Japanese with native Japanese speaker
3. Identify the kanji etymology as well as use it in basic vocabulary required for the JLPT/NAT 5 examination level
4. Read and write 100 kanji of the official JLPT N5
5. Choose the appropriate verb forms for learning and practicing the Japanese language

UNIT I Introduction to Japan and greetings 9 Hours

Japan : Land and culture - Introduction to Japanese language – Greetings – Seasons - Days of the week - Months of the year – Dates of the month - Self introduction – Numbers (Upto 99,999) – Expressing time – Conversation audio and video.

Listening: Listening to Greetings - Listening for Specific Information: Numbers, Time. Speaking: Self-Introduction

UNIT II Building vocabulary 9 Hours

Family relationships - Colours - Parts of body - Profession - Directions - Time expressions (today, tomorrow, yesterday, day before, day after) - Japanese housing and living style - Food and transport (vocabulary) - Stationery, fruits and vegetables

Listening: Listening for Specific Information: Directions, Family Members, Parts of body Speaking: Introducing one's family.

UNIT III Writing systems 9 Hours

Hiragana Chart 1 - vowels and consonants and related vocabulary – Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary – Introduction to Kanji – Basic Vocabulary – Basic Conversational Phrases.

Listening: Listening to Japanese Alphabet Pronunciation, Simple Conversation. Speaking: Pair Activity (Day to day situational conversation)

UNIT IV Kanji and preposition 9 Hours

Katakana script and related vocabulary – Basic kanjis: naka, ue, shita, kawa , yama , numbers (1- 10, 100, 1000, 10,000 and yen) , person, man, woman, child, tree , book ,

hidari, migi, kuchi , 4 directions - Usage of particles wa, no, mo and ka and exercises - Usage of kore, sore, are, kono, sono, ano, arimasu and imasu - Particles – ni (location) and ga , donata and dare - Particles ni (time), kara, made , ne , koko, soko, asoko and doko - Directions : kochira, sochira, achira and dochira , associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)

Listening: Listening to conversation with related particles

UNIT V Verb forms 9 Hours

Introduction to Verbs - Verbs –Past tense, negative - i-ending and na-ending adjectives introduction - ~masen ka, mashou - Usage of particles de, e , o, to, ga(but) and exercises - Adjectives (present/past – affirmative and negative) – Counters - ~te form

Listening: Listening to different counters, simple conversations with verbs and adjectives. Speaking: Pair Activity (Explaining one's daily routine by using appropriate particles and verbs)

Course Outcomes		**Cognitive Level**
At the end of this course, students will be able to:		
CO1:	Recognize and write Japanese alphabet	Understand
CO2:	Comprehend the conversation and give correct meaning	Understand
CO3:	Apply appropriate vocabulary needed for simple conversation in Japanese language	Apply
CO4:	Apply appropriate grammar to write and speak in Japanese language	Apply
CO5:	Speak using words of the Japanese language	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book:

T1. Genki 1 Textbook: An Integrated Course in Elementary Japanese by Eri Banno, Yoko Ikeda, Yutaka Ohno, Yoko Sakane, Chikako Shinagawa, Kyoko Tokashiki published by The Japan Times

T2. Genki 1 Workbook: An Integrated Course in Elementary Japanese by Eri Banno published by The Japan Times

Reference:

1. *Japan**e**se for Everyone: Elementary Main Textbook1-1*, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007
2. *Japanese for Everyone: Elementary Main Textbook1-2*, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007
3. www.japaneselifestyle.com
4. www.learn-japanese.info/
5. www.learn.hiragana-katakana.com/typing-hiragana-characters/
6. www.kanjisite.com/

Course Code:23FLT202	Course Title: FOREIGN LANGUAGE - GERMAN (Common to all B.E/B.Tech Programmes)		
Course Category: AEC		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course is intended to:

1. Listen and understand numbers, names and dialogues of a native speaker on par with A1 level.
2. Speak and introduce self in simple sentences to convey their opinion and ideas on par with A1 level.
3. Read simple passages and given text on par with A1 level.
4. Write letter and simple sentences on par with A1 level.

UNIT I BASIC INTRODUCTION TO GERMAN SCRIPTS 9

Theme and Text (Introduction to German - German script, Deutsche Namen, Daily Greetings and Expressions) – Grammar ('wh' questions, das Alphabet)– Speak Action (Buchstabieren, sich und andere vorstellen nach Namen und Herkunft fragen, internationale Wörter auf Deutsch verstehen, jemanden begrüßen)– pronunciation (Buchstabieren J,V,W,Y, - Long vowels A,E,I,O,U - Pronunciation of Ä,Ü,Ö) – To learn (internationale Wörter in Texten finden, Wörter sortieren)

Theme and Text (Gespräche im caf'e, Getränkekarte, Telefon-buch, Namen, Rechnungen) – Grammar (Frägesatze mit wie, woher, wo, was Verben in präsens Singular und Plural, das Verb Sein, Personalpronomen und Verben)– Speak Action (eine Gespräch beginnen sich und andere vorstellen zählen, etwas bestellen und bezhalen Telefonnummern und verstehen)– pronunciation (Wortakzent in Verben und in Zahlen) – To learn (Grammatiktabelle ergänzen, mit einem Redemittelkasten arbeiten)

UNIT II NUMBERS AND NOMINATIVE CASE 9

Theme and Text (Numbers – 1 to 12 (Eins bis Zwolf) – 20, 30, 40, 90 (zwanzig-Neunzig) – All Numbers (1-10000) – German Currency (Euro) – Basic Mathematics (plus, Minus, Malen, Geteilt durch)) – Grammar (Introduction of verbs –Have Verb – To Come, To Speak, To Read, To Drive, To Fly, To write, To Eat, To sleep, To take etc.,)

Theme and Text (Communication in course) – Grammar (Singular and Plural, Artikel: der,das,die/ ein,eine, verneinung: kein, keine, Komposita: das Kursbuch) – Speak Action (Gegenständen fragen/ Gegenstände benennen im kurs:) – pronunciation (word accent Marking, Umlaute ö ä ü hören und sprechen) – To learn (Lernkarten schreiben, Memotipps, eine Regel selbst finden)

Theme and Text (City, Town, Language: Nachbar, Sprachen, Sehenswürdigkeiten in Europa) – Grammar (Past tense for Sein, W-Frage, Aussagesatz und Satzfrage) – Speak Action (about city and siteseeing) – pronunciation (Satzakzent in Frage- und Aussagesätzen) – To learn (eine Regel ergänzen, eine Grammatiktabelle erarbeiten, Notizen machen)

UNIT III AKKUSATIVE CASE AND PREPOSITIONS 9

Theme and Text (Menschen und Hauser, Furniture catalogue, E-Mail, House information) – Grammar (possesivartikel im Nominativ, Artikel im Akkusativ, Adjektive im satz, Graduierung mit zu)– Speak Action (Whonung bescreiben about perons and things)– pronunciation (consonant - ch) – To learn (wortschatz systematisch)

Theme and Text (Termine - Appointment and punctuality in Germany) – Grammar (questions with wann?, Preposition (am, um, von... bis), verneinung mit nicht, trennbare verben, präteritum von haben) – Speak Action (Daily plan making, time commitment, excuse for late coming) – pronunciation (consonants- p,b,t,d / k,g) – To learn (Rollenkarten arbeiten)

Theme and Text (orientation in working area, go for work, floor plan city plan, office and computer) – Grammar (preposition: in,neben, unter, auf, vor, hinter, an, zwischen, bei und mit + Datic)– Speak Action (work place, work, giving appointments)– pronunciation (consonants: f,w und v) – To learn (Making notice in calender)

UNIT IV DATIV CASE AND PREPOSITIONS 9

Theme and Text (Holiday and Party, holiday plan, party plan in Germany) – Grammar (regular and iregular verbs) – Speak Action (holiday speak, accident, Ich-Text schreiben) – pronunciation (lange und kurze vokale markieren) – To learn (Text Order)

Theme and Text (organising an Excursion to Berlin through city orientation, Bus plan, City plan, post card, Excursion programme) – Grammar (preposition: in, durch, über + Akkusativ: zu, an... vorbei + Dativ, Modalverb wollen) – Speak Action (Tourism, culture, postcard preparation, travel description) – pronunciation (r and l)– To learn (plaket making)Theme and Text (Beruf und all Tag, Visiten karten, wörterbuch) – Grammar –

Speak Action (profession, statistic speaking) – pronunciation (n,ng and nk)– To learn (wörterbuch , text information in tabel)

UNIT V ADJECTIVES AND PRONUNCIATION 9

Theme and Text (Haushaltstipp, kochrezept, maße und gewichte, Mahlzeiten und Gerichte) – Grammar (jeden Tag, manchmal, nie, Question - welche, Comparison – viel, gut, gern) – Speak Action (about eat, drink question and answers) – pronunciation (e,en,el,er) – To learn (Text auswerten und zusammenfassen)

Theme and Text (Clothing , colour, weather) – Grammar (Adjecktive im Akkusativ, unbestimmer Artikel) – Speak Action (weather, dress and colour understanding) – pronunciation (e-o- ö and ie-u- ü) – To learn (wetter and Farben interkulturelle)

Theme and Text (in super market,purchase, House Maintainence, Emotion, Sports, Body parts) – Grammar (Modal Verb) – Speak Action (Body parts) – To learn (Rollenkarten arbeiten)

Course Outcomes		**Cognitive Level**
At the end of this course, students will be able to:		
CO1	Recognize and write German alphabet, numbers.	Understand
CO2	Comprehend the conversation and give correct meaning	Understand
CO3	Apply appropriate grammar and vocabulary to write and speak.	Apply
CO4	Apply appropriate cases and texts to listen, write and speak.	Apply
CO5	Speak and read using words of the German language	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

TEXT BOOK(s)

T1. Netzwerk, “Deutsch als Fremdsprache” by Stefanie Dengler, Paul Rusch, Helen Schmitz published by Goyal Publishers & Distributors Pvt Ltd;

T2. Funk, Kuhn, Demme, “Studio D A1 Deutsch als Fremdsprache” published by Goyal Publishers & Distributors Pvt Ltd;

REFERENCES(s)

R1. Hueber, “Fit for Goethe- Zertifikat A1 (Start Deutsch 1)” by GOYAL PUBLISHERS AND DISTRIBUTORS; 2016

Course Code: 23MAI202		Course Title: Complex Variables and Transforms (Common to AU, EC, EE, EV & ME)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3:0 :2	Credits: 4	Total Contact Hours:75	Max Marks:100

Course Objectives:

This course is intended to enable the student to acquire the knowledge on the calculus of functions of complex variables and continuous, discrete transforms.

Module I **23 Hours**

Vector Calculus

Gradient – Divergence – Curl – Line integrals – Surface integrals – Volume integrals – Theorems of Green, Gauss and Stokes (without proof) and their applications.

Complex Variables (Differentiation)

Cauchy-Riemann equations – Analytic functions – Properties – Harmonic functions – Finding harmonic conjugate – Conformal mapping (w=z+a, w= az, w=1/z,) – Mobius transformation and their properties.

Complex Variables I (Integration)

Cauchy Integral formula – Cauchy Integral theorem – Taylor's series – Singularities of analytic functions – Laurent's series.

Module II **22 Hours**

Complex Variables II (Integration)

Residues – Cauchy Residue theorem – Contour integrals – Evaluation of real definite integrals around unit circle and semi-circle (Excluding poles on the real axis).

Laplace Transform

Laplace Transform – Properties of Laplace Transform – Laplace transform of derivatives and integrals – Laplace transform of periodic functions -Inverse Laplace transforms - Convolution theorem – Solution of ordinary differential equations by Laplace Transform method.

Fourier Series

Dirichlet's condition -Fourier series – Even and odd functions- Half range sine and cosine series - Parseval's identity--Harmonic Analysis.

List of Experiments(Using Python):	30 Hours

1. Find gradient of a given scalar function, divergence and curl of a vector function.
2. Verify Green's theorem in a plane.
3. Graphically plot time and frequency domain of standard functions and compute Laplace transform of In- built functions.
4. Find the Fourier series of a periodic function.
5. Compute Inverse Laplace transform of In- built functions.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the concepts of Vector Differentiation and Integration.	Apply
CO2: Using the concept of complex variables to construct analytical functions and evaluate definite integrals.	Apply
CO3: Apply Laplace transform techniques to solve ordinary differential equations.	Apply
CO4: Compute the Fourier series expansion for given periodic functions.	Apply
CO5: Develop programs using Complex Variables and Transforms concepts through modern tool.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwinkreyzig, Advanced Engineering Mathematics, 10th edition, John Wiley& Sons, 2011.

T2. Veerarajan T., Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill, New Delhi, 2019.

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2002.

R2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112
2. https://nptel.ac.in/courses/111104031

Course Code : 23CHT201		Course Title: Chemistry for Mechanical Sciences (Common to ME & AU)	
Type of Course: Minor		Course Level: Introductory	
L:T:P(Hours/Week):3:0:0	Credits: 3	Total Contact Hours :45	Max Marks:100

Course Objectives

The Course is intended to impart the knowledge of Chemistry involved in water technology, Electrochemical cells, Corrosion and its control, Engineering materials and fuels and lubricants.

Module:I **23 Hours**

Water Technology: Water quality parameters- Hardness (Definition, types, units)- Estimation of Hardness (EDTA method). Boiler feed water -formation of deposits in steam boilers and heat exchangers (scale, sludge and caustic embrittlement). Water softening- Demineralization (Ion exchange method)- Desalination- Reverse Osmosis method. Roles and responsibility of women and individual in conservation of water.

Batteries and Fuel cells: Electrochemistry- Basic Terminologies - Conductometric, Potentiometric and pH titrations- Batteries- types and Characteristics. Construction, working and applications of Alkaline, Lead acid, and Lithium-ion batteries. Fuels cells- H_2O_2 fuel cell.

Corrosion and control: Corrosion- dry and wet corrosion, Galvanic series, Galvanic corrosion, differential aeration corrosion. Factors influencing corrosion.

Module:II **22 Hours**

Corrosion and control: Corrosion control method- material selection and design, cathodic protection techniques. Metallic coating- Galvanizing and Tinning, Electroplating- Nickel plating.

Engineering materials: Polymer-Classification, Functionality, degree of polymerization, number and weight average molecular weight (definition only). Thermo plastic and thermosets, Compounding of plastics. Polymer processing by injection and blow techniques. Polymer composites. Nano materials- Introduction – Difference between bulk and nanomaterials, size dependent properties. Applications of nanomaterials in electronics, energy science and medicine.

Fuels and Lubricants: Automotive fuels- Petrol, diesel, CNG, blended fuels – Composition, properties and uses. Petroleum- refining, knocking in petrol and diesel engine- octane and cetane rating of fuels. Calorific value- Gross and Net calorific value. Catalytic converters. Lubricants- Importance and classification, properties of liquid lubricants and their significance. Greases – common greases, types, and properties

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Interpret the concepts involved in water treatment, batteries and fuel cells, corrosion.	Apply
CO2: Apply the acquired knowledge of chemistry to solve the Engineering problems.	Apply
CO3: Analyze the Engineering problems through the concept of electro chemistry, water technology, Engineering materials and fuels.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Jain&Jain, Engineering Chemistry (All India), 17th Edition, Dhanpat Rai Publishing Company Pvt Ltd, New Delhi, 2018.

T2. Wiley Engineering Chemistry, 2nd edition, Wiley India Pvt Ltd, New Delhi, 2011.

Reference Book(s):

R1. Dara S.S., and Umare S.S., A text book of Engineering Chemistry, S. Chand & Co Ltd, New Delhi , 2014.

R2. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, Polymer Science, New Age International Pvt Ltd, Chennai , 2006.

R3. Renu Bapna and Renu Gupta, Engineering Chemistry, Macmillan India Publisher Ltd, 2010.

Web References:

1. http://nptel.ac.in/courses/122101001/downloads/lec.23.pdf
2. https://nptel.ac.in/courses/104106075/Week1/MODULE%201.pdf
3. https://nptel.ac.in/courses/103102015/

Course Code:23MEI201		Course Title: ENGINEERING MATERIALS (Common to AU,ME)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits: 3	Total Contact Hours:60	Max Marks:100

Course Objectives:

The course is intended to

To impart knowledge on crystal structure, phase analysis and heat treatment of ferrous alloy.

Module I **15 Hours**

Crystal Physics: Crystalline and Non crystalline materials. Single crystal, Polycrystalline materials Anisotrophic crystal parameters: Atomic radius, Number of atoms per unit cell, Coordination number, atomic packing factor for SC , BCC , FCC and HCP- Crystal planes: Miller indices, Braggs law . Interplanar distance- Polymorphism and allotrophy. Crystal imperfections: Point, line , surface and volume, grain boundary and its role in mechanical properties.

Ferrous alloy: Effect of alloying elements on properties of steel (Mn, Si, Cr, Mg, V and W). Properties and applications of stainless steel and Tool steel, Cast Iron-White, Malleable, Grey and Spheroidal Cast Iron-Properties and Applications

Non-Ferrous: Aluminium and its alloys, Copper and its alloys, Magnesium and its alloys, Titanium and its alloys, Nickel and its alloys- Composition, Properties and Applications. Industrial standards for alloys and other materials - alloying elements and inclusion of ceramics materials.

Module II **15 Hours**

Constitution of Alloys and Phase diagram: Constitution of alloys- Solid solutions- Substitutional and Interstitial. Phase diagrams- Interpretation of Phase diagram, Lever rule, Gibbs phase rule. cooling curve for pure metal, binary solid solution and binary eutectic system. Iron – Iron Carbide equilibrium diagram. Micro constituents in Fe_3C diagram (Austenite, Ferrite, Cementite, Pearlite, Martensite, Bainite), Pearlite transformation.

Heat Treatment: Heat treatment process-purpose of heat treatment – Process parameters. Bulk treatment: Annealing, Normalizing, Tempering, Quenching (Process parameter, application). Isothermal transformation Diagram (TTT Diagram). Cooling curves superimposed on TTT diagram. CCR - CCT. Hardenability- Jominy end quench test. Austempering, martempering — case hardening, carburizing, Nitriding, cyaniding, carbonitriding — Flame and Induction hardening.

List of Experiments **30 Hours**

1. Conduct the annealing operation for given ferrous alloy and analyze the microstructure.
2. Conduct the normalizing operation for given ferrous alloy and analyze the microstructure.
3. Conduct the Quenching operation for given ferrous alloy and analyze the microstructure.
4. Analyze the microstructure on non-ferrous alloy.
5. Analyze the hardness of the given material (Brinell and Rockwell).
5. Determine the micro hardness for the given sample.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Choose the suitable alloying elements for Ferrous and Non Ferrous alloys for industrial standard and analyze the crystal structures.	Apply
CO2: Apply the knowledge of composition changes in phase diagram and analyze the microstructure.	Apply
CO3: Analyze the heat treatment process for given ferrous material to meet industrial standards.	Analyze
CO4: Conduct experiments to demonstrate concepts related to heat treatment process and analyze the variations of microstructure.	Analyze

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	2	2	-	-	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1. William D Callister “Material Science and Engineering”, John Wiley and Sons, 2014.

Reference Book(s):

R1. Dieter G. E., “Mechanical Metallurgy”, McGraw Hill Book Company, 2013.

R2. Sidney H Avner “Introduction to Physical Metallurgy”, Tata McGRAW-Hill, 2017.

R3. Raghavan.V “Materials Science and Engineering”, Prentice Hall of India Pvt., Ltd., 2015.

Web References:

1 http://nptel.ac.in/courses/113106032/

2 https://www.coursera.org/specializations/ physical metallurgy

Course Code: 23MEL201		Course Title: COMPUTER AIDED DRAFTING AND MODELLING LABORATORY (Common to AU,ME)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to

The course is intended to create CAD model and 3D print the given part/assembly drawing.

Module I **15 Hours**

The basics of modelling: Create a basic sketch, Fully define a complex sketch, Create and shell a drafted part, Create a Revolve, Apply fillets to a model, Create a feature pattern, Create parameters, Link parameters and dimensions, Use symmetry and construction, geometry, Create construction planes, Create extruded features, Create extruded cuts, Project edges vs. including them, Use boundary fill, Create sheet metal parts.

The basics of assemblies: The different ways to create components, Use scripts to create gears, Component color swatch and color cycling, Use McMaster-Carr parts in a design, Copy, paste, and paste new, Distributed designs, Create as-built joints, Create joints, Joint origins and mid plane joints, Drive joints and motion studies, Interference detection and contact sets, Isolation and opacity control, Create groups and organize a timeline.

Exploring design tools for production : Create draft during a feature, Create draft as a feature, Add ribs and plastic supports, Analyze draft on a design, Create holes and threads, Use a coil feature, Mirrors and patterns, Surface creation for complex geometry, Use surfaces to replace faces, Use surfaces to split bodies and faces.

Module II **15 Hours**

Creating complex designs with form tools: Introduction to forms, Create a form primitive, Add or remove symmetry, Manipulate faces edges and vertices, Convert BREP faces to forms, Crease or uncrease an edge, Insert edges and subdivisions, Repairs and modifications, Add a bevel, Work with a form as a BREP.

Additive Manufacturing: Create an additive CAM setup, Create custom material presets, Validate slicing through simulation, Generate G-Code for a 3D printer.

List of Experiments **30 Hours**

1. Develop the part drawing of 3D components using CAD tools.
2. Develop the production drawing of given machine components using CAD tools.
3. Develop the assembly model of the simple coupling
4. Model a laundry detergent bottle and print the same using 3D printer.
5. Model and 3D print a device stand Design an adjustable device stand that can be customized to hold any smart phone or small tablet.

Course Outcomes:

CO1: Develop the 3D model for the given concept and print the same using 3D printer as a team.	Apply
CO2: Create the part model and assemble the given parts using CAD tools.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	-	-	-	3	-	-	-	2	_
CO2	3	-	-	-	2	-	-	-	-	-	-	-	2	_

Text book(s):

T1. Parametric Modeling with Autodesk Fusion 360 by Randy H. Shih.

T2. Autodesk Fusion 360 Black Book (V 2.0.15293) – Part 1 by Gaurav Verma and Matt Weber.

T3. Autodesk Fusion 360 Black Book (V 2.0.12670) – Part 2 by Gaurav Verma and Matt Weber.

T4. Autodesk Fusion 360 – The Master Guide by Samar Malik.

T5. Autodesk Fusion 360 Exercises: 200 Practice drawings for Fusion 360 by Sachidanand Jha.

T6. Autodesk Fusion 360: A Tutorial Approach – 2nd edition by Prof. Sham Tickoo , Purdue University, Northwest , USA

Web References:

1. Introduction to Modeling and Design for Manufacturing:
   https://www.autodesk.com/learn/ondemand/course/fusion360-intro-modeling-design-professional
2. CAM additive manufacturing
   https://www.autodesk.com/learn/ondemand/module/fusion-cam-additive-manufacturing

Course Code: 23CHL201		Course Title: Chemistry for Mechanical Sciences Laboratory (Common to ME &AU)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week): 0:0:3	credits:1.5	Total Contact Hours :45	Max Marks:100

Course Objectives:

The Course is intended to analyze the Dissolved Oxygen, Hardness, Iron, Chloride content, and Corrosion rate, Molecular weight of polymer and Properties of various lubricants.

List of experiments: (Any 10 experiments)

1. Determination of Total, Temporary and Permanent Hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of the water sample by Argentometric method.
5. Estimation of iron content of the water sample using Spectrophotometer.
6. Conductometric titration of strong acid Vs strong base.
7. Estimation of Fe^{2+} by potentiometric titration.
8. Determination of strength of given hydrochloric acid using p^H metry.
9. Corrosion experiment - weight loss method.
10. Determination of molecular weight of Polyvinyl alcohol using Ostwald viscometer.
11. Green synthesis of silver nanoparticles by Neem leaf
12. Determination of Cloud and Pour Point.

Course Outcomes At the end of this course, students will able to:	Cognitive Level
CO1: Understand the concept of volumetric and instrumental methods through chemistry laboratory.	Understand
CO2: Apply the knowledge of chemistry to investigate engineering materials by volumetric and instrumental methods and analyze, interpret the data to assess and address the issues of Environmental Problems.	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	3	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. A Text book on Experiments and calculations in Engineering Chemistry by SS Dara, 9th Edition, S Chand publications, 2015.

R2. Instrumental methods of chemical analysis, Chatwal and Anand, 5th Himalaya Publications,2023.

R3. Lab manual of Chemistry for Mechanical Sciences Laboratory prepared by Chemistry faculty members.

Web References:

1. https://archive.nptel.ac.in/courses/104/106/104106121/

2. https://academic.oup.com/book/42038/chapter-bstract/355779823?redirectedFrom=fulltext

Course Code: 23MEL202		Course Title: ENGINEERING PRACTICES LABORATORY (Common to AU,CE,ME)	
Course Category: SEC		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on basic electrical, mechanical and civil operations.

List of Experiments

Electrical & Electronics

1) Symbols of electrical and electronic components and study of electrical drawing.
2) Insulation Testing using Megger.
3) Soldering practice of simple circuit and testing.
4) Fluorescent tube, staircase and house wiring.
5) Verification of Kirchhoff's current and voltage law.

Civil & Mechanical

1. Make a wooden Tee joint to the required dimension.
2. Make a "V" filling to the required dimension using fitting tools.
3. Make a tray in sheet metal to the required dimension.
4. Assemble the pipeline connections with different joining components for the given layout.
5. Demonstrate a butt joint using welding process to the required dimension.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply engineering knowledge to conduct experiments and analyze the electrical and electronic connections as per the given circuit.	Analyze
CO2: Apply to make wooden 'T' joint, and pipeline connection individually using various workshop tools as per the given dimensions.	Apply
CO3: Apply to make metal 'V' joint with various joining components and a permanent joint as per the given dimensions using modern workshop tools and engineering principles.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	-	2	-	-	-	-	2	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. Jeyachandran.K, Natarajan.S & Balasubramanian.S, “A Primer on Engineering Practices Laboratory”, Anuradha Publications, TamilNadu (India), 2016.

R2. 19EPL21 - Engineering practices laboratory Manual.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://www.aaaenggcoll.ac.in/engineering-practices-lab/
3. https://www.coursera.org/courses?query=engineering

Course Code: 23ESL201		Course Title: Professional Skills 1:Problem solving skills & Logical Thinking 1 (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		**Course Level: Introductory**	
L:T:P(Hours/Week) 0: 0: 2	**Credits: 1**	**Total Contact Hours:30**	**Max Marks:100**

Course Objectives:

The course is intended to enhance the students' numerical, analytical and logical reasoning ability.Also course focus to make learners prepare for various public and private sector exams and placement drives.

Module I Quantitative Ability **20 Hours**

Number System and LCM & HCF- Percentage- Ratio and Proportion - Average- Progressions- Ages- Partnership- Mixture & Allegation - Profit and loss- Interest calculation- Data interpretation.

Module II Reasoning Ability **10 Hours**

Seating Arrangement- Linear, circular and Complex – Direction Problems- Blood Relation- Puzzles- Crypt arithmetic- Venn diagrams- Statement and conclusion- Statement and argument- Causes and effects- Self-Learning.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Build the competence in numerical, analytical and logical reasoning ability	**Apply**

Textbook(s):

T1: Dr. R. S. Aggarwal. "Quantitative Aptitude for Competitive Examinations" Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. "A Modern Approach to Logical Reasoning", Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018

Reference Book(s):

R1: R. V. Praveen. "Quantitative Aptitude and Reasoning" 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013

R2: Arun Sharma. "Quantitative Aptitude for Common Aptitude Test", McGraw Hill Publications, 5th Edition, 2020

R3: Arun Sharma. "Logical Reasoning for Common Aptitude Test", McGraw Hill Publications, 6th Edition, 2021.

Web References:

1 https://www.indiabix.com/aptitude/questions-and-answers/

2 https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

High-3; Medium-2; Low-1

Course Code: 23VAT201	Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்ள இயலும்.

CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்ள இயலும்.

தமிழரும் தொழில்நுட்பமும்

அலகு 1 – நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

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

அலகு 2 – வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ஷ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள், பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக் கலை.

அலகு 3 – உற்பத்தித் தொழில்நுட்பம் 3

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

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன் வளம் – முத்து மற்றும் முத்துக் குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு 5 – அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

Course Outcomes மாணவர்கள் இப்பாடத்தை கற்றபின்	**Cognitive Level**
CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

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 சங்க கால 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) (Published by: The Author)

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

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

Course Code: 23VAT201	Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.
2. Understand the Scientific Tamil & Tamil Computing.

TAMILS AND TECHNOLOGY

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 of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 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

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.	Understand
CO.2 Understand the Scientific Tamil & Tamil Computing.	Understand

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

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 சங்க கால 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) (Published by: The Author)

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

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

Course Code: 23CHT202		Course Title: Environmental Sciences (Common to all B.E/B.Tech Programmes)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 1: 0: 0	Mandatory NonCredit Course	Total Contact Hours: 15	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on sustainable utilization of natural resources, prevention of pollution, disaster management and environmental issues & public awareness on ecosystem.

Module I **8 Hours**

Natural Resources

Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

Environmental Pollution and Disaster Management

Role of an individual in prevention of pollution; Disaster management : floods, earthquake, cyclone and landslides.

Environmental Ethics and Legislations

Environmental ethics : Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation.

Module II **7 Hours**

Environmental Issues and Public Awareness

Public awareness - Environment and human health.

Environmental Activities

(a) Awareness Activities:

i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.
ii. Slogan making event.
iii. Poster making event.

(b) Actual Activities:

i. Plantation.
ii. Cleanliness drive.
iii. Drive for segregation of waste.
iv. To know about the different varieties of plants.
v. Shutting down the fans and ACs of the campus for an hour or so.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the use of natural resources for a sustainable life as an individual in prevention of pollution.	Understand
CO 2: Apply the environmental ethics and legislations for various environmental issues.	Apply
CO 3: Create the public awareness on environment and human health as an individual or team through various activity based learning.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	3	3	-	-	-	-
CO3	3	-	-	-	-	3	3	-	3	3	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.

T2. Mackenzie Davis and Susan Masten, "Principles of environmental engineering and science", Mc-Graw Hill, 3rd Edition, 2014.

Reference Book(s):

R1. Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, Enviro Media.

R2. Cunningham, W.P.Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview.
2. https://en.wikipedia.org/wiki/Environmental_science.

SEMESTER III

Course Code: 23MAT302		Course Title: Numerical Methods	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3:1 :0	Credits: 4	Total Contact Hours:60	Max Marks:100

Course Objectives:

The students able to solve the system of linear equations and nonlinear equations use of matrix algebra techniques that is needed by engineers for practical applications and familiarize with Interpolate the given data and calculate the numerical derivatives and integration. To familiarize the Solve the initial value and boundary value problems using numerical techniques.

Module I **30 Hours**

SOLUTION OF SYSTEM OF LINEAR EQUATIONS AND EIGENVALUE

Solution of system of linear equations, Gauss elimination method, Crout‟s method, iterative methods of Gauss Jacobi and Gauss Seidal method, Eigen values of matrix by power method.

SOLUTION OF NON-LINEAR EQUATIONS AND CURVE FITTING

Solution of non-linear equations: Method of false position, Newton Raphson method, order of convergence. Curve fitting: Method of least square fit a straight line, fitting a curve.

INTERPOLATION, POLYNOMIAL APPROXIMATION

Interpolation with equal intervals, Newton‟s forward and backward difference formulae, interpolation with unequal interval, Lagrange‟s interpolation, numerical differentiation

Module II **30 Hours**

NUMERICAL INTEGRATION

Numerical integration, trapezoidal rule, Simpson‟s rule, double integration using trapezoidal rule and Simpson‟s rule.

INITIAL VALUE PROBLEM FOR ORDINARY DIFFERENTIAL EQUATIONS

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 method.

BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS

Solution of two-dimensional Laplace’s and Poisson’s equations, one dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods, one dimensional wave equation by explicit method.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate the concepts of numerical methods to engineering problems.	Understanding
CO2: Apply the concept of various numerical techniques for solving non-linear equations and system of linear equations.	Apply
CO3: Apply the knowledge of Interpolation and determine the integration and differentiation of the function by using the numerical data.	Apply
CO4: Determine the solution of initial and boundary value problems using numerical techniques.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwin Kreyzig, “Advanced Engineering Mathematics”, 10th edition, John Wiley & Sons, 2015.
T2. Veerarajan T., “Engineering Mathematics for First Year”, Tata McGraw-Hill, New Delhi, 2011.
T3. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 1st edition, 2017.

Reference Book(s):

R1. Thomas G.B. and Finney R.L., “Calculus and Analytic Geometry”, 9th edition, Pearson, Reprint, 2010.
R2. Bali N.P. and Manish Goyel, “A Text book of Engineering Mathematics”, Laxmi Publication, 9^{th} edition, 2010.
R3. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 43rd Edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc16_ma05
2. https://nptel.ac.in/courses/122101003/2

Course Code: 23MET301	Course Title: ENGINEERING MECHANICS (Common to ME & AU)		
Course Category: Major	**Course Level:** Introductory		
L:T:P(Hours/Week) 2: 1: 0	**Credits:** 3	**Total Contact Hours:** 45	**Max Marks:** 100

Course Objectives:

The course is intended to impart knowledge on Static force analysis on simple elements, Kinematics of mechanisms and Kinetics of rigid bodies.

Module I **23 Hours**

Force Analysis of Beams, Frames and Machines: Fundamental laws of mechanics (Review) – Free body diagram – Statics - Particles and Rigid – Types of forces – Action (Point, UDL, UVL and couples) – Reaction (Supports, Friction) – Governing equations of equilibrium – Equivalent force and couple moment – Types of beams – Determining reactions in statically determinate beams – Bending moment diagram and Shear force diagram of cantilever, simply supportedbeam and over hanging beams – Analysis of frames – Machines – Laws of dry friction – ladder and wedge frictions.

Geometric Properties of Lamina and Bodies: Properties of surfaces – centroid of composite planes such as L, I and T – Moment of Inertia (MI) – Parallel and perpendicular axis theorem – MI of composite sections involving simple geometries such as rectangle, circle and triangle – Centre of gravity and mass moment of inertia of composite solids involving block, cylinder, cone and sphere. Center of gravity for simple machine structures.

Module II **22 Hours**

Introduction to Mechanisms: Mechanism and structure – links – pairs – chains – four bar and slider crank mechanisms – degrees of freedom of linkages – Gruebler's criterion – Grashof's condition of rotatability - transmission angle and mechanical advantage – special lower pair mechanisms: Peucelliar straight line mechanism, Ackermann steering mechanism, pantograph, Geneva mechanism.

Kinetics of Rigid Body: Dynamic equilibrium of rigid bodies – Planar kinetics of rigid body – Force and Acceleration, Work and energy, Impulse and momentum

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Determine various forces on rigid bodies such as beams, frames and machines under static conditions.	Apply
CO2: Calculate centroids, center of gravity and moment of inertia of simple Shapes and machine structures	Apply
CO3: Determine the degrees of freedom of given mechanism.	Apply
CO4: Calculate the kinetic parameters of rigid bodies for dynamic equilibrium.	Apply
CO5: Prepare and present a case study on the analysis of the forces in a real world application	Evaluate

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. R C Hibbeler, “Engineering mechanics – Statics and Dynamics”, 14th Edition, Pearson, New Delhi, 2017.

T2. S.S. Rattan, “Theory of Machines”, McGraw Hill Education, 4thEdition.2017.

Reference Book(s):

R1. F.P. Beer and Jr. E.R. Johnston, “Vector Mechanics for Engineers – Statics and Dynamics”, 10th Edition Tata McGraw Hill publishing company, New Delhi, 2017.

R2. R.S. Khurmi, J.K Gupta, “Theory of Machines” , S.Chand, 14th Edition. 2005.

R3. Irving H. Shames, “Engineering mechanics – Statics and Dynamics”, 14th Edition, Pearson, New Delhi, 2014.

Web References:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
2. https://nptel.ac.in/courses/122104015/

Course Code: 23AUI301		Course Title: Engineering Thermodynamics and Heat Transfer	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) : 2:0:2	Credits: 3	Total Contact Hours: 60	Max Marks:100

Course Objectives:

1. Calculate the performance of steady flow devices by applying laws of thermodynamics.
2. Calculate the performance of systems operates on Otto, Diesel and Dual cycles.
3. Calculate the rate of heat transfer by the various and combined modes of heat transfer.
4. Select the suitable type of extended surface and heat exchanger for automotive applications.

Module I **15 Hours**

Basic concepts: Thermodynamic systems, Characteristics of boundary and surroundings, Intensive and extensive properties. Equilibrium, Zeroth law of thermodynamics.

Thermodynamic properties: Pressure, Temperature, Internal energy, Flow energy, Enthalpy, Specific properties, Specific heat, sensible heat, Work transfer and heat transfer.

Gas laws, Ideal gas, real gas, Phase change, Latent heats, Pure substance, Types of steam.

First law of thermodynamics: Non-cyclic and cyclic process – Simple problems on cyclic process by applying first law. Control volume, control surface, and steady flow energy equation applied to compressors, turbines, engines, nozzles, heat exchangers – Simple problems.

Second law of thermodynamics: Causes of irreversibility, principle of increase of entropy, Carnot power cycles - Simple problems on Reversible Heat engines and Reversed heat engines

Gas power cycles: Carnot cycle, Stirling cycle, Ericsson cycle, Otto cycle, Diesel cycle, dual cycle, air standard efficiency, Problems.

Module II **15 Hours**

Introduction to modes of heat transfer: Fourier's law of conduction, thermal conductivity and thermal diffusivity, One dimensional steady sate conduction in a plane wall, Heat transfer through composite cylinder, Thermal resistance and electrical analogy, Problems.

Fins: Types, Shapes, Effectiveness and efficiency, applications.

Convection: Newton's law of cooling, dimensionless numbers, laminar and turbulent flow. Forced convection: Calculation of heat transfer in Flow over a flat plate and cylinder, Comparison of forced and free convection heat transfer.

Radiation: Laws of radiation, radiation properties, black body and grey body, shape factor.

Combined modes of heat transfer, comparison between modes of heat transfer and their types.

Heat exchanger: Types, Applications in Automobile fields. Temperature profiles in parallel and counter flow heat exchangers.

List of Experiments **30 Hours**

1. Conduct performance test on reciprocating air compressor (CO1).
2. Calculate the fin efficiency and effectiveness using pin-fin apparatus (CO2).
3. Determine the rate of heat transfer by forced convection (CO3).
4. Determine the overall thermal resistance of a composite wall (CO3).
5. Calculate the effectiveness of parallel / counter flow heat exchanger (CO4).

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Apply the laws of thermodynamics to non- flow processes, flow process and cycles to assess the performance of steady flow devices	Apply
CO2: Suggest the methods to select a suitable fin for the applications	Apply
CO3: Apply the electrical analogy to different modes of heat transfer and find the parameters involved	Apply
CO4: Design a heat exchanger required for a specific application	Evaluate

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

Textbooks:

T1. Yunus A. Cengel and Michael A. Boles, Thermodynamics - An Engineering Approach in SI Units, Tata McGraw Hill Publishing Company, New Delhi, 2017.

T2. P. K. Nag, Engineering Thermodynamics, Edition 6, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

T3. Yunus A. Cengel, Afshin J. Ghajar, “Heat and Mass Transfer”, McGraw-Hill Education, 5th ed, 2014.

Reference Book(s):

R1. T. D. Eastop and McConkey, Applied Thermodynamics for Engineering Technologists, Pearson, New Delhi, 2004

R2. R. C. Sachdeva, “Fundamentals of Engineering Heat and Mass Transfer”, New Age Internationals, 5th edition, 2017.

R3. J. Holman, Souvik Bhattacharyya, “Heat Transfer”, McGraw Hill Education, 10th Edition, 2017.

Web References:

1. NPTEL - https://nptel.ac.in/courses/112105123/1

Course Code: 23MET302	Course Title: FLUID MECHANICS AND HYDRAULICS MACHINERY (Common to ME & AU)		
Course Category: Major		**Course Level :** Introductory	
L:T:P(Hours/Week) 2: 1:0	**Credits: 3**	**Total Contact Hours:45**	**Max Marks:100**

Course Objectives:

The course is intended to enable the impart knowledge on laws of fluid mechanics and evaluate pressure, velocity and acceleration fields for various fluid flows and performance parameters for hydraulic machinery.

Module I **24 Hours**

Fluid properties

Fluid- definition, classification of fluids, units and dimensions, Properties of fluids- density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, capillarity and surface tension.

Flow characteristics

Continuity equation and Bernoulli's equation, Application- venturi meters, orifice meters, Pitot tube, flow through pipes.

Laminar flow- boundary layer concepts, boundary layer thickness, Turbulent flow –losses-Darcy-Weisbach equation, Friction factor and Moody diagram, Minor losses, Flow through pipes in series and in parallel, Hydraulic and energy gradient.

Module II **21 Hours**

Dimensional analysis and Model analysis

Dimensional analysis- Need and methods - Buckingham's π theorem. Similitude, types of similitude, Dimensionless parameters, application of dimensionless parameters, Model analysis.

Pumps

Classification of pumps- Centrifugal pump- working principle, velocity triangles, Efficiencies and performance curves.

Reciprocating pump- classification, working principle, indicator diagram, Air vessels and performance curves , Dismantle and assembly of various types of pumps.

Turbines

Classification of turbines, heads and efficiencies, velocity triangles, Pelton, Francis and Kaplan turbines, working principle and construction, work done by water on the runner, draft tube,

performance curves, governing of turbines.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply mathematical knowledge to predict the properties and characteristics of a fluid.	Apply
CO2: Calculate the major and minor losses associated with pipe flow in piping networks.	Apply
CO3: Prepare and present a demonstrate on the dismantle and assembly of various types of pumps	Apply
CO4: Select a suitable hydraulic turbine and pump for the customer specifications	Analyze

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1 Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, Laxmi Publications (P) Ltd., New Delhi,Ninth Edition, 2017.

T2 YunusCengel, John Cimbalal , “Fluid Mechanics- Fundamentals and Applications”, Tata McGraw-Hill Education, 2014.

Reference Book(s):

R1. White, F.M., "Fluid Mechanics", 5th Edition Tata McGraw-Hill,New Delhi, 2013

R2. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", 9th Edition McGraw-Hill education,2017.

R3. Kumar, K.L., "Engineering Fluid Mechanics", 7th edition Eurasia Publishing House (P)Ltd., New Delhi, 2014.

Web Reference(s):

1. https://nptel.ac.in/courses/112104118
2. https://nptel.ac.in/courses/112105171

Course Code: 23MET303	Course Title: MANUFACTURING PROCESSES (Common to ME & AU)		
Course Category: Major	**Course Level:** Introductory		
L:T:P(Hours/Week): 3:0: 0	**Credits: 3**	**Total Contact Hours: 45**	**Max Marks: 100**

Course objectives

The course aims to empower students to effectively apply concepts of manufacturing process.

Module I **22 hours**

Casting process - Introduction, Types, Sand casting - Solidification and Cooling, Patterns, Molds and Cores, Gating system and functions, Runner and riser, Die casting, Centrifugal casting, Casting defects. Moulding of Plastic Components - Injection molding, Blow molding, Compression molding, Molding defects, Testing and inspection of casting.

Forming process – Introduction, Types, Fundamentals of Hot and Cold Working Processes, Plastic Deformation and Yield Criteria, Load Estimation for Bulk (Forging, Extrusion, Rolling, and Drawing) and Sheet metal (Blanking, Piercing, Bending, Drawing) forming processes, Explosive Forming, Electro - hydraulic forming, Defects, Introduction of Powder Metallurgy process.

Joining Process - Operating principle, basic equipment, Electrodes and its Coatings, Manual metal arc welding, Gas Tungsten arc welding, Gas metal arc welding, Submerged arc welding, Gas welding, Flame characteristics, Resistance welding, Weld defects, Brazing and soldering, Testing of welded joints.

Module II **23 hours**

Theory of metal cutting - Types of chips, oblique cutting, orthogonal cutting, cutting forces, cutting tools nomenclature, tool wear, tool life, machinability, cutting tool materials, surface finish and machinability, cutting fluids.

Machining Processes: Centre lathe - Constructional features, operations – machining time and power estimation. Drilling machine - Constructional features, operations. Milling machine - Constructional features, operations. Abrasive processes: grinding wheel, specification. Grinding process – cylindrical grinding, surface grinding, centerless grinding- dressing, truing and balancing of grinding wheels. process parameters and process planning.

Advanced Manufacturing Methods: EDM, 3D Printing, Digital Manufacturing – Application and Advantages, Automation and Robotics in Manufacturing.

Course Outcomes:

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

CO1: Select appropriate manufacturing processes for the specified design requirement.	Apply
CO2: Estimate the process parameters for forming of bulk, sheet metal Components.	Apply
CO3: Calculate the process parameters for the machining of circular and prismatic components.	Apply
CO4: Prepare and present a process plan for manufacturing the specified design requirement as a team.	Analyze

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

1. Hajra Choudhury S.K, Hajra Choudhury. AK., and Nirjhar Roy "Elements of workshop Technology volume I: Manufacturing Processes", Media promoters and Publishers Private Limited, 2023
2. Kalpakjian. S, Steven R. Schmid, “Manufacturing Engineering and Technology”, Pearson Education India, 8th edition, 2023
3. Rao. P.N “Manufacturing Technology - Metal Cutting and Machine Tools", 4th Edition, McGraw Hill Education (India) Private Limited, 2018.

Reference Book(s):

1. Hajra Choudhury S.K and Nirjhar Roy, "Elements of workshop Technology volume II: MachineTools", Media promoters and Publishers Private Limited, 2023.
2. Rao, P.N. "Manufacturing Technology - Foundry, Forming and Welding", 4th Edition, McGrawHill Education (India) Private Limited, 2018.
3. Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd., 2014.

Web References:

1. https://archive.nptel.ac.in/courses/112/107/112107219/
2. https://onlinecourses.nptel.ac.in/noc22_me28/preview

Course Code: 23MEL301	Course Title: MANUFACTURING PROCESSES LABORATORY (Common to ME & AU)		
Course Category: Major	**Course Level: Introductory**		
L:T:P (Hours/Week) 0:0:3	**Credits: 1.5**	**Total Contact Hours: 45**	**Max. Marks: 100**

Course Objectives

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

List of Experiments:

1. Make a sand mold using the given pattern.
2. Make a component as per the drawing using Hydraulic / Mechanical Press.
3. Join the given thick metal sheets using suitable welding process.
4. Make a shaft as per the drawing using the lathe machine.
5. Make a hole as per the drawing using drilling machine.
6. Perform the milling operation on the part as per the drawing using Vertical milling machine
7. Perform the milling operation on the part as per the drawing using Horizontal milling machine
8. Perform grinding operation on the shaft as per the drawing
9. Perform surface grinding operation as per the drawing
10. Assemble the parts to produce a product as per the drawing.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Select suitable process parameter and prepare process planning sheet for the components in the given drawing.	Apply
CO2: Produce a product as per the given dimensions using various manufacturing processes.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	2	-	-	2	2	-	-	2	-	-	-	-	-	2

High-3; Medium-2; Low-1

Reference Book(s):

1. Hajra Choudhury S.K, Hajra Choudhury. AK., and Nirjhar Roy "Elements of workshop Technology volume I: Manufacturing Processes", Media promoters and Publishers Private Limited, 2023
2. Kalpakjian. S, Steven R. Schmid, “Manufacturing Engineering and Technology”, Pearson Education India, 8th edition, 2023
3. Rao. P.N “Manufacturing Technology - Metal Cutting and Machine Tools", 4th Edition, McGraw Hill Education (India) Private Limited, 2018.
4. Hajra Choudhury S.K and Nirjhar Roy, "Elements of workshop Technology volume II: Machine Tools", Media promoters and Publishers Private Limited, 2023.
5. Rao, P.N. "Manufacturing Technology - Foundry, Forming and Welding", 4th Edition, McGrawHill Education (India) Private Limited, 2018.
6. Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd., 2014.

Web References:

1. https://archive.nptel.ac.in/courses/112/107/112107219/
2. https://onlinecourses.nptel.ac.in/noc22_me28/preview

Course Code: 23MEL302		Course Title: FLUID MECHANICS AND HYDRAULICS MACHINERY LABORATORY (Common to ME & AU)	
Course Category: Major		**Course Level :** Practice	
L:T:P(Hours/Week) 0:0:3	**Credits: 1.5**	**Total Contact Hours:45**	**Max Marks:100**

Course Objectives:

The course is intended to provide practical knowledge in verification of principles of fluid flow, pressure, discharge and velocity of fluid flow, Major and Minor Losses and gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head.

List of Experiments: **45 Hours**

1. Determination of coefficient of discharge of given Orifice meter.
2. Determination of coefficient of discharge of given Venturi meter.
3. Determination of the velocity of flow using Pitot Tube
4. Determination of friction factor of given set of pipes.
5. Performance study of Centrifugal pumps
6. Performance study of curves of Gear pump.
7. Performance study of reciprocating pumps.
8. Performance characteristics of a Pelton wheel.
9. Performance test on a Francis Turbine.
10. Performance test on a Kaplan Turbine

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1:Determine the actual and theoretical discharge of fluid flow using various flow measuring devices.	Apply
CO2: Determine friction factor and Reynolds Number for a fluid flow through pipe.	Apply
CO3: Conduct performance tests and draw the characteristics curves ofpumps and turbines	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	2	2	-	-	2	-	-	-	-	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1 Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, Laxmi Publications (P) Ltd., NewDelhi, Ninth Edition, 2017.

T2 YunusCengel, John Cimbalal , “Fluid Mechanics- Fundamentals and Applications”, Tata McGraw-Hill Education, 2014.

Reference Book(s):

R1. White, F.M., "Fluid Mechanics", 5th Edition Tata McGraw-Hill,New Delhi, 2013

R2. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", 9th Edition McGraw-Hill education,2017.

Web References:

1. https://nptel.ac.in/courses/112104118
2. https://archive.nptel.ac.in/courses/112/106/112106311/
3. https://www.youtube.com/watch?v=8iZe_UiBtTc&list=PLZ5iF05Ly-kgGWarGh0iIdUIu4cz7Hrdw

Course Code: 23ESL301		Course Title: PROFESSIONAL SKILLS 2: PROBLEM SOLVING SKILLS & LOGICAL THINKING 2 (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		**Course Level :** Introductory	
L:T:P(Hours/Week) 0: 0: 2	**Credits: 1**	**Total Contact Hours:30**	**Max Marks:100**

Course Objectives:

The course is intended to enhance the students' numerical, analytical and logical reasoning ability. Also course focus to make learners prepare for various public and private sector exams and placement drives.

Module I Quantitative Ability **20 Hours**

Time and work –Pipes and cisterns- - Time Speed Distance-Problems on Trains-Boats and Streams- Permutation and Combination-Probability, Menstruation- Heights and distance- Logarithms- Clocks and Calendars – Data Sufficiency

Module II Reasoning Ability **10 Hours**

Number & Alpha series- Odd man out-Coding and Decoding-Syllogisms- -Problems on Cubes and Dices- Logical Venn diagram -Visual Reasoning- Element & logical series- Analogies.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Enhance their problem solving skills & Logical thinking Skills	**Apply**

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

T1: Dr. R. S. Aggarwal. "Quantitative Aptitude for Competitive Examinations" Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. "A Modern Approach to Logical Reasoning", Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018

Reference Book(s):

R1: R. V. Praveen. “Quantitative Aptitude and Reasoning” 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013

R2: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020

R3: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021.

Web References:

1 https://www.indiabix.com/aptitude/questions-and-answers/

2 https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Code:23VAT301	Course Title: UNIVERSAL HUMAN VALUES 2 :UNDERSTANDING HARMONY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		**Course Level: Practice**	
L:T:P (Hours/Week) 2: 1: 0	**Credits:3**	**Total Contact Hours:45**	**Max. Marks:100**

Pre-requisites

- Induction Program

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society andnature/existence
4. Development of commitment and courage to act
5. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

Unit I Introduction to Value Education 9 Hours

Need for the Value Education;. Self -exploration as the process for value education ; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities ; Happiness and Prosperity: current scenario ; Method to fulfill the Basic human aspirations

Unit II Harmony in Human Being 9 Hours

Human being as a co-existence of self (‘I’) and the material ‘Body’; needs of Self ('I') and 'Body'; The Body as an instrument of 'I' ; Harmony in the self(‘I’); Harmony of the self(‘I’) with body ;Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III Harmony in the Family and Society 9Hours

Harmony in the Family the basic unit of human interaction; Values in human to human relationship;Trust as the foundational values of relationship; Respect as the right evaluation ;Understanding harmonyin the society (society being an extension of family); Vision for the universal human order

Unit IV Harmony in the Nature **9 Hours**

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

Unit V Harmony on Professional Ethics **9**

Hours Natural acceptance of human values ;Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professionalethics ;Case study: holistic technologies, management models and production systems ;Strategy fortransition towards value based life and profession.

Course Outcomes	**Affective Level**
At the end of this course, students will be able to:	
CO1. Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO2. Appraise physical, mental and social well being of self and practice techniques to promote well being.	Responding
CO3. Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO4. Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO5. Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, NewDelhi, 2010.

Reference Book(s):

R1.Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.R2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx
2. http://hvpenotes.blogspot.com/
3. https://nptel.ac.in/courses/109/104/109104068/

Course Code: 23AUS301	Course Title: Defensive Driving Skill Training		
Course Category: SEC		Course Level: Practice	
L:T:P(Hours/Week) 0:0 :2	Credits: -	Total Contact Hours:30	Max Marks:100

Course Objectives:

The most important job of any driver is safe driving. This Defensive Driving course aims to develop knowledge awareness and skills amongst road users about road safety issues and ensure practical cooperation and communication between relevant bodies. It recognizes the best practices and the application of practical and research experience. The content of this course is a combination of theoretical and practical sessions. An effective Defensive Driving training program helps organizations prevent significant accidents, achieve their obligations, and fulfill legal requirements and Operational Control requirements.

Module I **20 Hours**

Introduction to Defensive Driving: Traffic Rules and Regulations - Traffic Signs and Signals, Road Markings, Speed Limits, Right of Way Rules, Local Traffic Laws and Regulations. Vehicle Safety and Maintenance - Vehicle Inspection and Maintenance, Understanding Vehicle Systems (brakes, tires, lights, etc.), Emergency Equipment and Tools, Pre-Trip Inspection Procedures

Driving Strategies and Techniques: Visual Scanning and Hazard Perception, Safe Following Distances, Lane Management and Lane Changing, Intersection Navigation, Highway and Urban Driving. Adverse Conditions and Emergency Situations - Driving in Various Weather Conditions (rain, snow, fog, etc.), Night Driving, Handling Skids and Hydroplaning, Emergency Stops and Evasive Maneuvers, Collision Avoidance Techniques

Module I **10 Hours**

Psychology of Driving and Risk Management: Driver Behavior and Attitudes, Managing Stress and Fatigue, Dealing with Aggressive Drivers, Alcohol and Drug Impairment, Risk Assessment and Management

Practical Driving Sessions: Hands-On Driving Practice, Simulated Driving Scenarios, Real-World Driving Experience, Feedback and Evaluation

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Understand the principles of traffic rules and regulations.	Understand
CO 2: Exhibit responsible driving behavior and attitude in different driving conditions.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	1	-	3	3	-	1	-	1	1	-
CO2	1	-	-	-	1	-	3	3	-	1	-	1	1	-

High-3; Medium-2; Low-1

Reference Book(s):

R1. Defensive Driving Techniques by Anthony J. Scotti

R2. Roadcraft: The Police Driver's Handbook by Philip Coyne and Penny Mares

R3. National Highway Traffic Safety Administration (NHTSA) Guidelines and Publications.

R4. Local Traffic Laws and Regulations (specific to your region)

Web References:

1. https://parivahan.gov.in/parivahan/

Course Code: 23MAT401		Course Title: Probability and Statistics (Common to EC, EE, ME, AU, CS, AM, SC, IT & EV)	
Course Category: Minor		Course Level: Introductory	
L: T: P (Hours/Week) 3:1:0	Credits: 4	Total Contact Hours:60	Max Marks:100

Course Objectives:

This course aims at helping the students to gain knowledge on random variables, probability distributions and hypothesis testing for data.

Module I **22+8 Hours**

Probability and Random Variables: Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables-One Dimensional Randon variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties- Two Dimensional Random Variables - Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression using least square method – Transformation of random variables.

Standard Distributions: Discrete Distributions - Binomial- Poisson- Properties, Moment generating functions -Continuous Distributions - Uniform –Exponential- Normal Distributions and their properties.

Module II **23+7 Hours**

Testing of Hypotheses: Sampling distributions, Estimation of parameters, Statistical hypothesis, Large sample test based on Normal distribution for single mean and difference of means, Tests based on t-test, Chi-square distributions and F distributions for mean, variance and proportion, Contingency table (test for independent), Goodness of fit.

Design of Experiments: Analysis of Variance (ANOVA) - One-way Classification – Completely Randomized Design (CRD) – Two-way Classification – Randomized Block Design (RBD) – Latin square**.**

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate the concepts of probability theory to engineering problems.	Understand
CO2: Calculate the expected values, variances and correlation coefficient of random variables	Apply
CO3: Use the theoretical discrete and continuous probability distributions in the relevant application areas.	Apply
CO4: Apply the concepts of testing the hypothesis and design of experiments to solve real life problems.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. Veerajan T, “Probability, Statistics and Random process”, 3rd Edition, Tata McGraw-Hill, New Delhi, 2017.

T2. Dr.J.Ravichandran, “Probability and Statistics for Engineers”, 1stEdition, Wiley India Pvt. Ltd., 2010.

Reference Book(s):

R1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, “Probability and Statistics for Engineers and Scientists”, 9th Edition Pearson Education, Asia, 2013.

R2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, “Schaum's Outlines Probability and Statistics”, 4th Edition Tata McGraw Hill edition, 2012.

R3. Morris DeGroot, Mark Schervish, “Probability and Statistics”, Pearson Educational Ltd,4th Edition, 2014, India.

Web References:

1 https://archive.nptel.ac.in/courses/111/105/111105090/

2. https://archive.nptel.ac.in/courses/111/105/111105041/

Course Code: 23MET401		Course Title: STRENGTH OF MATERIALS (Common to ME & AU)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to provide knowledge in mechanics of materials so that the students can solve real engineering problems and design engineering systems.

Module I **23 Hours**

Deformation of Solids and Bi-axial State of Stress: Stress and Strain – Types - Hooke's law - Factor of Safety - Poisson's ratio. Deformation of simple and compound bars under axial load. Strain energy - resilience, proof resilience and modulus of resilience - Strain energy due to axial load. Stresses due to gradual load, sudden load and impact load. Principal planes and stresses – Maximum shear stress and planes of maximum shear stress – Mohr's circle.

Flexure in Beams and Deflection of Beams: Theory of simple bending – Bending stress and Shear stress variation in beams of standard section like 'I', 'L' and 'T'. Evaluation of beam deflection and slope for cantilever and simply supported beams- Macaulay and Moment-area methods.

Thin-wall pressure vessels: Longitudinal Stress, Hoop stress - application - Stresses and Strain in cylindrical thin shells.

Module II **22 Hours**

Theories of Failure: Introduction to theories of failure - Maximum Principal Stress theory - Maximum Principal Strain theory - Maximum Strain Energy Theory - Maximum Distortion Energy theory - Maximum Shear Stress theory.

Shafts and Springs: Theory of torsion and assumptions - torsion equation- polar moment of inertia and polar modulus - Shear stress distribution in solid and hollow circular shafts.,Equivalent bending moment and equivalent twisting moment, Stresses in circular shaft with combined bending, axial loading and torsion.

Helical compression springs - terminology, types of end - stress and deflection equation. Leaf springs - terminology - stress and deflection equation - Nipping of leaf springs.

Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

Course Outcomes	Cognitive Level
At the end of the course students will able to	
CO1: Apply the concepts of stresses at a point in a material of structural elements.	Apply
CO2: Select the appropriate theories of failure for the materials.	Apply
CO3: Evaluate the behavior of torsional members and deflection in beam members.	Apply
CO4: Evaluate the behavior of columns and struts.	Evaluate
CO5: Present an oral presentation on terms involved in stresses induced and failure of the given component**.**	Evaluate

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. F. Beer, E. R. Johnston, J. De Wolf, “Mechanics of Materials”, Tata McGraw-Hill PublishingCompany Limited, New Delhi, Indian 1st Edition, 2008.

T2. S. S. Rattan, “Strength of Materials”, Tata McGraw-Hill Publishers, 4th Edition, 2011.

Reference Book(s):

R1.R. K. Rajput, “Strength of Materials: Mechanics of Solids”, S. Chand & Co Limited, New Delhi, 3rdEdition, 2007.

R2. S. S. Bhavikatti, “Strength of Materials”, Vikas Publishing House Pvt. Ltd., New Delhi, 3rd Edition,2013.

Web References:

1. https://nptel.ac.in/courses/112107146
2. https://nptel.ac.in/courses/112106141

Course Code 23MET402		Course Title : MECHANICS OF MACHINES (Common to ME & AU)	
Course category: Major		Course level: Introductory	
L:T:P (hrs/week): 3:1:0	Credits: 4	Total contact Hours: 60	Maximum Marks:100

Course Objective

The course is intended to impart knowledge on mechanism/machine and its kinematics including vibration.

Module 1 **36 Hours**

Velocity and Acceleration in Simple Mechanisms: Basics of kinematics- Link- pair-chain-mechanisms. Configuration/kinematic diagram, degrees of freedom of planar mechanisms – Linear and angular velocities- absolute and relative velocities- rubbing velocity- tangential, radial and Coriolis components of acceleration, graphical method for determination of velocity and acceleration of the links in four bar mechanism and single slider crank mechanism.

Kinematics of cam: Types of cams, types of followers, radial cam, terminology of radial cam, types of follower motions: uniform velocity motion, simple harmonic motion, constant acceleration/deceleration motion, cycloidal motion, construction of cam profile for knife edge, roller and flat faced followers – Graphical method.

Gear Kinematics: Types of gears- Spur, Helical, Bevel and worm gear –its terminologies, law of gearing, Classification of gear trains, calculation of Gear ratio, number of teeth for the gears in the gear trains, velocities of the gears in gear trains such as Simple, Compound, Reverted & Epicyclic (using tabulation method) gear trains, Differential gear train (theory only).

Module II **24 Hours**

Mechanism for Control: Gyroscopes –Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles

Balancing of masses: Static and dynamic balancing - Balancing of rotating masses – Balancing of single rotating mass, Balancing of several masses in single or several planes- Balancing of reciprocating masses (Introduction only).

Vibration: Introduction- Terminology- types of vibrations- Types of free vibration- Natural frequency of free longitudinal, transverse and torsional vibrations. Effect of inertia- natural frequency of free transverse vibration due to point load on a simply supported shaft. Introduction to Critical speed and damping. Torsion vibration in single, two and three rotor system- Torsion ally equivalent shaft.

Course Outcome	Cognitive level
At the end of the course the students will be able to	
CO1: Calculate the kinematics parameters of simple mechanisms, Cam , gear and gear trains	Apply
CO2: Estimate the gyroscopic effect on automobiles	Apply
CO3: Determine the balancing masses required for balancing rotating masses in single or several planes.	Apply
CO4: Determine the natural frequency of a free longitudinal, transverse and torsional vibrating system.	Apply
CO5: Form teams and develop a model of a simple mechanism and demonstrate its working both written and orally.	Create

Course Articulation Matrix

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

Text Book(s):

1. Rattan S.S., "Theory of Machines", 4th Edition, McGraw Hill Education, New Delhi, 2017.
2. Kurmi.R.S., Textbook Of Theory of Machines, 5TH Edition, S.CHAND, 2020.

Reference Book(s):

1. Norton R.L., "Kinematics and Dynamics of Machinery", Special Indian Edition, McGraw Hill Education,New Delhi, 2017.

2. Shigley J.E, Pennock G.R, Uicker J.J Cornwell & Sanjeev Sanghi., "Theory of Machines and Mechanisms",5th Edition, Oxford University Press, Oxford, 2017.

3. Dayvid H Myszka, “Machines and Mechanisms Applied Kinematic Analysis”, Pearson Prentice Hall, 2012.

Web Reference(s):

1. https://onlinecourses.nptel.ac.in/noc23_me64/preview
2. https://onlinecourses.nptel.ac.in/noc23_me36/preview
3. https://kdm-iitkgp.vlabs.ac.in/

Course Code: 23AUI401		Course Title: Automotive Engines	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 3:0:2	Credits: 4	Total Contact Hours: 75	Max. Marks:100

Course Objectives:

1. Compare the construction and working of IC engines.
2. Suggest the suitable IC engines subsystems to the specified applications.
3. Infer the influences of combustion chamber geometry.
4. Explore the recent developments employed in IC engines.

Module I **25 Hours**

Heat engines, engine components and functions, engine nomenclature, classification, 4 stroke engines, 2 stroke engines, valve timing diagram, port timing diagram.

SI engine: Construction, working and applications, Carburetion, air-fuel ratio, importance, requirements, simple carburetor, working, petrol injection, throttle body and multi point injections. Ignition system: requirements, ignition timing, battery coil, magneto, CDI and distributor-less ignition, spark plug.

CI engine: Construction, working and applications. Fuel injection system functional requirements, inline and rotary injection systems, working, feed pump, atomizer, injection pump, injector and nozzles.

Cooling and Lubrication system: Importance of cooling, cooling system classification, air cooling system, liquid cooling system, coolant properties, thermostat, thermo-syphon, forced circulation cooling. Lubrication system, engine friction fundamentals, influence of engine variable on friction, functions of the lubrication system, mist lubrication, wet sump lubrication, construction and working.

Exhaust system, exhaust manifold, exhaust down pipe, resonator, muffler, tailpipe, catalytic converter.

Module II **20 Hours**

Combustion in IC Engine: Richard's combustion theory, SI engine, combustion stages, factors affecting SI engine combustion, knocking. SI Engine combustion chamber, Types.

CI Engine, combustion stages, abnormal combustion, factors affecting CI engine combustion. CI engine combustion chambers, classification, factors controlling combustion chamber design. Air motion, swirl, squish and turbulence.

Spark advance mechanisms, centrifugal and vacuum advance mechanism, Cold starting devices in Diesel engines.

Advancement in IC Engines: Supercharger and turbocharger, HCCI, Lean burn engine, stratified charge engine, four valve and overhead cam engines, variable valve timing (VVT), variable geometry turbochargers (VGT), electronic engine management, CRDI, GDI, DAQ System — combustion and heat release analysis in engines.

List of Exercises 30 Hours
1. Plot valve timing and port timing diagram.
2. Dismantle, identify the components and assemble the given petrol engine
3. Dismantle, identify the components and assemble the given diesel engine.

4. Dismantle, identify and assemble the given fuel injection system components.
5. Dismantle, identify and assemble the given cooling and lubrication system components.
6. Dismantle, identify and assemble the given ignition system components.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Compare the construction and working of IC engines.	Apply
CO2: Suggest the methods to improve the performance of power producing devices.	Apply
CO3: Infer the influences of combustion chamber geometry.	Apply
CO4: Explore the recent developments employed in IC engines.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Mathur M.L. and Sharma R.P., Internal Combustion Engines, Dhanpat Rai Publishing, 7th edition, 2014.

T2. Ganesan V, Internal Combustion Engines, Tata McGraw Hill, 4th edition, 2018.

T3. Ramalingam K.K., Internal Combustion Engines, SciTech Publications, 3rd edition, 2018.

Reference Book(s)

R1. John B. Heywood, Internal Combustion Engines Fundamentals, McGraw Hill, 2nd edition, 2018.

R2. Pundir, B. P., I. C. Engines: Combustion and Emissions, Narosa Publishing House, New Delhi, Reprint, 2017.

Course Code: 23AUT401		Course Title: Automotive Chassis and Transmission	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on frames, steering system, clutch, gear box and braking system of vehicles.

Module I **23 Hours**

Frames and Bodies: Classification of vehicles, types of chassis layout with reference to power plant locations. Vehicle frames, loads acting on vehicle frames, types of frames – Ladder frame, Integral frame, tubular frame.

Steering and Suspension System: Front Axle - Steering system- working mechanism- steering layouts, front wheel geometry. Ackermann and Davis steering system, steering gear boxes and power assisted steering, Multi axle steering system

Suspension system **-** Need- Types of suspension system-Wishbone & Mc Pherson -. Types of suspension Spring- Leaf spring, Coil Spring. Shock Absorber- types, tandem axle suspension system

Clutch: Clutch - types of clutches- single plate clutch-multiple plate clutch-centrifugal clutch.

Module II **22 Hours**

Gear Box: Gear box –Types of Gear Box. Simple epicyclic gear box- Continuously Variable Transmission (CVT).

Drive Line: Drive Axles - Types, stub axle – types. Drive lines- Hotchkiss drive, torque tube drive. Final Drive **-**types of final drive. Differential- Types of Differentials, Power divider. Wheels and Tires –Types of wheels. Tire -nomenclature-Types of Tires.

Braking System: Braking system – Purpose, stopping distance, braking torque, stopping time and braking efficiency. Classifications of brakes- drum brakes and disc brakes-mechanical, hydraulic, pneumatic braking system and Anti-lock braking system

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Identify the different chassis frames used in the on road and off-road vehicles quadrant.	Understand
CO2: Plot a steering system layout for dependent suspension and independent suspension based on the conditions for true rolling.	Apply
CO3: Compare the construction and working of various types of friction clutches and gear boxes used in vehicles.	Apply
CO4: Select suitable drive line components for on-road vehicles and off-road vehicles.	Apply

CO5: Compare the construction and working of disc brake and drum brake based on the efficiency and stopping distance.	Apply
CO6: Develop a prototype model of automotive chassis and transmission systems component.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1	1	1
CO3	2	1	-	-	-	-	-	-	-	-	-	1	2	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1	2	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1	2	1
CO6	3	3	-	-	-	-	-	-	-	-	-	1	1	1

High-3; Medium-2; Low-1

Text Book(s):

T1. Heinz heizler, “Advanced Vehicle Technology” – ButterworthHeinemann.2005.

T2. P S. Gill, “Automobile Engineering”, S.K. Kataria & Sons, 2014

T3. Newton, Steeds and Garrot- “Motor Vehicles”- Butterworths, London- 2010.

Reference Book(s):

R1. Heldt.P.M.- “Automotive Chassis”- Literary Licensing, LLC, 2012.

R2. N K Giri “Automobile Mechanics” Khanna Publications,2015.

Course Code: 23MEL401		Course Title: STRENGTH OF MATERIALS AND MECHANICS OF MACHINES LABORATORY (Common to AU,ME)	
Course Category: Major		Course Level: Practice	
L:T:P(Hours/Week) 0:0:3	Credits: 1.5	Total Contact Hours: 45	Max. Marks: 100

Course Objectives

To provide hands on training for testing the mechanical strength of materials and determining the kinematic parameters of machines such as velocity, acceleration, frequency etc.

List of Experiments:

Strength of Materials Laboratory

1. Conduct tensile test on the given mild steel rod using universal testing machine.
2. Determine the maximum shear strength of Mild steel / Aluminium rod by Double shear test.
3. Calculate the modulus of rigidity of mild steel rod by Torsion test.
4. Determine the toughness of the given mild steel specimen using IZOD and CHARPY impact test.
5. Estimate the stiffness and modulus of rigidity of the helical spring by Compression test.

List of Experiments:

Mechanics of Machines Laboratory

1. Draw the velocity and acceleration diagram for the given configuration for four bar/slidercrank mechanism and verify the same with Vlab
2. Balance the unbalance mass available in a single and multiple planes in the rotor andverify the same with VLab

3. Find the natural frequency of the spring mass system
4. Find the torsional frequency of the two rotor system
5. Find the gear ratios of the given gear train and verify the same with theoretical values
6. Determine the experimental and theoretical values of critical (or) whirling speed of agiven shaft.
7. Draw the profile of the cam and find the jump speed
8. Demonstration of use of FFT analyzer in vibration measurement

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Form a team and evaluate tensile, shear, impact strength and stiffness of the given test specimen experimentally and compare the results withvirtual lab.	Evaluate
CO2: Determine the velocity and acceleration of a simple mechanisms, jump speed of the given cam mechanism and gear ratios of the simple gear train.	Apply
CO3: Analyze the natural frequencies of longitudinal, transverse, and torsional systems, and Interpret the significance of vibration measurement in mechanical systems through both written and oral explanations.	Analyze

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	-	-	-	-	-	2	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	2	-	-	-	-

Reference Book(s):

1. S. S. Bhavikatti, “Strength of Materials”, Vikas Publishing House Pvt. Ltd., New Delhi, 5thEdition, 2021.

2. R. K. Rajput, “A Text book of Strength of Materials”, S. Chand & Co Limited, New Delhi,Revised Edition, 2018.

3. Rattan S.S., "Theory of Machines", 4th Edition, McGraw Hill Education, New Delhi, 2017.

4. Norton R.L., "Kinematics and Dynamics of Machinery", Special Indian Edition, McGraw HillEducation , New Delhi, 2017.

5. Shigley J.E, Pennock G.R, Uicker J.J Cornwell & Sanjeev Sanghi., "Theory of Machines andMechanisms", 5th Edition, Oxford University Press, Oxford, 2017.

Web References:

1. https://sm-nitk.vlabs.ac.in/
2. https://dom-nitk.vlabs.ac.in/
3. https://mdmv-nitk.vlabs.ac.in/
4. https://mm-nitk.vlabs.ac.in/
5. https://va-coep.vlabs.ac.in/

Course Code: 23AUL401	Course Title: Fuels, Engine Performance and Emission Testing Laboratory		
Course Category: Major		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 3	Credits: 1.5	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to determine the fuel properties, the performance and emission characteristics of IC engines.

List of Experiments

1. Conduct ASTM distillation test of given fuel.
2. Determine the temperature dependence of viscosity of given fuel.
3. Determine flash and fire point of given fuel.
4. Conduct retardation test on single cylinder diesel engine.
5. Conduct performance test on diesel engine.
6. Conduct performance test on petrol engine.
7. Conduct heat balance test on IC engine.
8. Conduct morse test in a multi cylinder petrol injection engine.
9. Plot P-θ and P-V diagrams of engine performance using EPA software.
10. Conduct emission test on turbocharged engine.
11. Conduct a performance test on fuel injection pump of a diesel engine.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Determine the liquid fuel properties such as flash point, fire point, viscosity and vapor characteristics as per ASTM standards.	Apply
CO2: Determine and improve the performance characteristics of SI and CI engines.	Apply
CO3: Execute and implement the BS - IV emission norms in a given engine.	Create

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Reference(s):

R1. “Fuels, engine performance and emission testing laboratory manual”, MCET-Automobile Engineering, 2023.

Course Code: 23ESL401		**Course Title Professional Skills 3 : Professional Development and Etiquette (Common to all B.E/B.Tech Programmes)**	
Course Category: SEC		**Course Level: Introductory**	
L:T:P(Hours/Week) 0: 0: 2	**Credits: 1**	**Total Contact Hours:30**	**Max Marks:100**

Course Objectives:

The course is intended to cultivate students' appropriate etiquette across various personal and professional contexts, fostering professionalism and effective communication.

Module I **15 Hours**

Emotional Intelligence

Intrapersonal Skill: Goal Setting- Self-management- Emotional Intelligence: Understanding & Developing EI for Effective Communication and Relationships – Enhancing Social Skills

Professional Development

Introduction to Professional Development - Career State Assessment - Set Career Goals- Stay on Industry Trends - Self & Lifelong learning – Creativity - Problem Solving Skills - Strong Fundamentals – Using/ Creating Opportunities – Work & Life Balancing - Revisiting Goals

Teamness and Interpersonal skills

Paraphrasing: Techniques for Active Listening -Paraphrasing as a Tool for Effective Understanding and Communication – Collaboration and Team Building: Building Trust and Rapport - Self-paced learning.

Module II **15 Hours**

Effective Communication

Effective Verbal Communication - Assertive Communication - Elements of Effective Communication - Barriers to Effective Communication - Persuasion Skills - Effective Presentation: Oral and visual presentation – Drafting formal reports.

Professional Etiquette

Introduction - Types of professional Etiquette- Personal Grooming: Importance of Personal Grooming in Professional Settings- Dress Codes and Professional Appearance Guidelines- Body language - Social – Email – Telephonic – Dining – Classroom - Business.

Activities:

- Emotional Intelligence: Scenario based role play, Debate
- Paraphrasing: Listening, Reading
- Effective Presentation:
    - Oral Presentation: Self-Introduction, JAM , Extempore speech
    - Visual presentation: Email Writing, Power Point Presentation, Vlog
- Professional Etiquette: Demonstrate required Professional Etiquette in all the above activities.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Communicate effectively and exhibit Professional etiquettes in various social forums.	**Apply**

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Textbook(s):

T1. Sabina Pillai, Agna Fernandez, “Soft Skills & Employability Skills”, Cambridge University Press 2018

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