Francis Xavier Engineering College

(An Autonomous Institution)
Tirunelveli 627 003
Tamil Nadu India

Department of Mechanical Engineering

Curriculum and Syllabi – R 2021-UG

CHOICE BASED CREDIT SYSTEM AND OBE

Vision of the Department

To produce competent Mechanical Engineers of excellent technical and managerial skills with profound morality for global, national and confront societal development.

Mission of the Department

1. To provide quality education in Mechanical Engineering with inter disciplinary approach, encouraging innovation, research and entrepreneurship through world class infrastructure and proficient teachers.

2. To make the department self-reliant through multiple programs with excellent curriculum, best practices and industry exposure.

3. To inculcate technical, professional, leadership skills, moral ethics and lifelong learning.

Table of Content

Programme Educational Outcomes (PEOs)

Bachelor of Mechanical Engineering curriculum is designed to impart Knowledge, Skill and Attitude on the graduates to

PEO 1: Have a successful professional career in Mechanical Engineering and allied industries, either by employment or through entrepreneurship.

PEO 2: Establishcompetencyin Design, Thermal, Materials and Manufacturing system with ethics and social responsibility.

PEO 3: Demonstrate ability for higher studies, research and lifelong learning.

Programme Outcomes(POs)

Engineering Graduates will be able to:

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

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

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

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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

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

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

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

Programme Specific Outcomes (PSOs)

On successful completion of the Mechanical Engineering Degree programme, the Graduates shall exhibit the following

PSO 1: Design mechanical components/subsystem(s), prepare production drawing using CAD tools and select suitable manufacturing process.

PSO 2: Formulate and analyse energy and mass flow in thermal devices.

PSO 3: Design, analyse, optimize and realize manufacturing processes / systems to meet industrial competitiveness.

Mapping with PO,PSO Vs PEO

PO	PEO1	PEO2	PEO3
1	✓	✓	✓
2	✓	✓	✓
3	✓	✓	✓
4	✓	✓	✓
5	✓	✓	✓
6	✓	✓	
7	✓		✓
8	✓	✓	✓
9	✓		
10	✓	✓	✓
11	✓		
12	✓		✓
PSO1	✓	✓	✓
PSO2	✓	✓	✓
PSO3	✓	✓	✓

FRANCIS XAVIER ENGINEERING COLLEGE

B.E. – XXX REGULATIONS 2021

Choice Based Credit System and Outcome Based Education

SUMMARY OF CREDIT DISTRIBUTION

S.No	Category	Credits Per Semester								Total Credits	Credits in %
		I	II	III	IV	V	VI	VII	VIII		
1	HSSM	3	2	3				3		**11**	6.55
2	BS	12	4	4						**20**	11.9
3	ES	5	14	3						**22**	13.09
4	PC			12	21	20	11		3	**67**	39.89
5	PE						6	9	3	**18**	10.71
6	OE					3	3	3	3	**12**	7.15
7	EEC			1	1	1	4	5	6	**18**	10.71

Minimum Number of Credits to be Acquired:168

HSS - Humanities and Social Sciences including Management

BS - Basic Science

ES - Engineering Sciences

PC - Professional Core

PE - Professional Elective

OE – Open Elective/Programme Specific Elective for Expandable Scope

EEC - Employability Enhancement Course

FRANCIS XAVIER ENGINEERING COLLEGE

B.E. – MECHANICAL ENGINEERINGREGULATIONS 2021

Choice Based Credit System and Outcome Based Education

I-VIII Semester Curricula and Syllabi

SEMESTER I

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21GE1101	English for Professional Communication	HSSM	3	2	0	1	**3**
2	21GE1201	Matrices and Advanced Calculus	BS	4	3	1	0	**4**
3	21GE1302	Engineering Physics	BS	3	3	0	0	**3**
4	21GE1401	Engineering Chemistry	BS	3	3	0	0	**3**
Practical cum theory courses								
5	21CS1514	C Programming	ES	5	1	0	4	**3**
Practical Courses								
1	21GE1311	Physics and Chemistry Lab	BS	4	0	0	4	**2**
2	21GE1512	Engineering Workshop	ES	4	0	0	4	**2**
			Total	26	15	1	4	**20**

SEMESTER II

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21GE2101	English for Technical Communication	HSSM	2	2	0	0	**2**
2	21GE2201	Partial Differential Equation and Application of Fourier Series	BS	4	3	1	0	**4**
3	21ME2501	Engineering Mechanics	ES	3	3	0	0	**3**
Theory cum Practical Courses								
4	21GE2501	Fundamentals of Electrical and Electronics Science	ES	5	3	0	2	**4**
Practical Courses								
1	21ME1513	Computer Aided Engineering Graphics	ES	6	2	0	4	**4**
2	21CS2512	Python programming	ES	5	1	0	4	**3**
			Total	26	13	1	12	**20**

SEMESTER III

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA3201	Probability and Statistical Analysis	BS	4	3	1	0	**4**
2	21ME3601	Engineering Thermodynamics	PC	4	3	0	0	**3**
3	21ME3602	Fluid Mechanics and Machinery	PC	4	3	0	0	**3**
4	21ME3501	Engineering Materials and Metallurgy	ES	3	3	0	0	**3**
5	21GE3101	Ethical and Moral Reasoning	HSSM	3	3	0	0	**3**
6	21GE2M02	Indian Constitution and Cultural Heritage	MC	2	2	0	0	**0**
Theory cum Practical Courses								
1	21ME3602	Manufacturing Technology – I	PC	5	3	0	2	**4**
Practical Courses								
1	21ME3602	Computer Aided Machine Drawing Laboratory	PC	4	0	0	4	**2**
2		Aptitude and Cognitive Skills –I	EEC	4	0	0	4	**1**
			Total	33	20	3	10	**23**

SEMESTER IV

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21ME4601	Manufacturing Technology – II	PC	3	3	0	0	**3**
2	21ME4602	Strength of Materials	PC	3	3	0	0	**3**
3	21ME4603	Thermal Engineering	PC	3	3	0	0	**3**
4	21ME4604	Kinematics of Machines	PC	3	3	0	0	**3**
5	21ME4605	Metrology and Instrumentations	PC	3	3	0	0	**3**
6	21GE2M01	Environmental Science and sustainable Engineering	MC	2	2	0	0	**0**
Practical Courses								
1	21ME4606	Manufacturing Technology Laboratory	PC	4	0	0	4	**2**
2	21ME4607	Thermal Engineering Laboratory	PC	4	0	0	4	**2**
3	21ME4608	Fluid Mechanics and Strength of materials Laboratory	HSS	4	0	0	4	**2**
4		Aptitude and Cognitive Skills –II	EEC	4	0	0	4	**1**
			Total	33	17	0	16	**22**

SEMESTER V

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21ME5601	Heat and Mass Transfer	PC	3	3	0	0	**3**
2	21ME5602	Dynamics of Machines	PC	3	3	0	0	**3**
3	21ME5603	Design of Machine Elements	PC	3	3	0	0	**3**
4	OE1	Elective – I (Open)	OE	3	3	0	0	**3**
Theory cum Practical Courses								
1	21ME5604	Mechatronics	PC	5	3	0	2	**4**
Practical cum Theory Courses								
2	21ME5605	CAD/CAM	PC	5	1	0	4	**3**
Practical Courses								
1	21ME5606	Heat and Mass Transfer Laboratory	PC	4	0	0	4	**2**
2	21ME5607	Metrology and Dynamics Laboratory	PC	4	0	0	4	**2**
3		Professional development skill-III	EEC	4	0	0	4	**1**
			Total	31	15	0	16	**24**

SEMESTER VI

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21ME6601	Design of Transmission Systems	PC	3	3	0	0	**3**
2	21ME6602	Finite Element Analysis	PC	3	3	0	0	**3**
3		Total Quality Management	PC	3	3	0	0	**3**
4	PE1	Elective – II	PE	3	3	0	0	**3**
5	PE2	Elective – III	PE	3	3	0	0	**3**
6	OE2	Elective – IV(Open)	OE	3	3	0	0	**3**
Practical Courses								
1	21ME6603	Computer Aided Engineering Laboratory	PC	4	0	0	4	**2**
2	21ME6604	Product Development Project – Phase – I	EEC	6	0	0	6	**3**
3		Professional development skill-IV	EEC	4	0	0	4	**1**
			Total	32	18	0	14	**24**

SEMESTER VII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1		Principles of Management	PC	3	3	0	0	**3**
2	PE3	Elective – V	PE	3	3	0	0	**3**
3	PE4	Elective – VI	PE	3	3	0	0	**3**
4	PE5	Elective – VII	PE	3	3	0	0	**3**
5	OE3	Elective – VIII (Open)	OE	3	3	0	0	**3**
6		Intellectual Property Rights (Audit)	EEC	2	2	0	0	**0**
Practical Courses								
1	21ME7601	Product Development Project – Phase – II	EEC	6	0	0	6	**3**
2		Comprehension	EEC	4	0	0	4	**2**
			Total	27	17	0	10	**20**

SEMESTER VIII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21ME8601	Project Management and Economics	PC	3	3	0	0	**3**
2	PE6	Elective – IX	PE	3	3	0	0	**3**
3	OE4	Elective – X (Open)	OE	3	3	0	0	**3**
Practical Courses								
1	21ME8602	Project Work	EEC	12	0	0	12	**6**
			Total	21	9	0	12	**15**

Minimum Number of Credits to be Acquired:168

List of Humanities and Social Sciences Including Management (HSSM)

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21GE1101	English for Professional Communication	HSSM	3	2	0	1	**3**
2	21GE2101	English for Technical Communication	HSSM	2	2	0	0	**2**
3	21GE3101	Ethical and Moral Reasoning	HSSM	3	3	0	0	**3**
4		Principles of Management	PC	3	3	0	0	**3**

List of Basic Science Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21GE1201	Matrices and Advanced Calculus	BS	4	3	1	0	**4**
2	21GE1302	Engineering Physics	BS	3	3	0	0	**3**
3	21GE1401	Engineering Chemistry	BS	3	3	0	0	**3**
4	21GE2201	Partial Differential Equation And Application of Fourier Series	BS	4	3	1	0	**4**
5	21MA3201	Probability and Statistical Analysis	BS	4	3	1	0	**4**
Practical Courses								
1	21GE1311	Physics and Chemistry Lab	BS	4	0	0	4	**2**

List of Engineering Science Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21ME2501	Engineering Mechanics	ES	3	3	0	0	**3**
2	21ME3501	Engineering Materials and Metallurgy	ES	3	3	0	0	**3**
Theory cum Practical Courses								
	21GE2501	Fundamentals of Electrical and Electronics Science	ES	5	3	0	2	**4**
Practical cum Theory Courses								
1	21ME1513	Computer Aided Engineering Graphics	ES	6	2	0	4	**4**
2	21CS1514	C Programming	ES	5	1	0	4	**3**
3	21CS2512	Python programming	ES	5	1	0	4	**3**
Practical Courses								
1	21GE1512	Engineering Workshop	ES	4	0	0	4	**2**

List of Employability Enhancement Course

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1		Intellectual Property Rights (Audit)	EEC	2	2	0	0	**0**
Practical Courses								
1		Aptitude and Cognitive Skills –I	EEC	4	0	0	4	**1**
2		Aptitude and Cognitive Skills –II	EEC	4	0	0	4	**1**
3		Professional development skill-III	EEC	4	0	0	4	**1**
4		Product Development Project – Phase – I	EEC	6	0	0	6	**3**
5		Professional development skill-IV	EEC	4	0	0	4	**1**
6		Product Development Project – Phase – II	EEC	6	0	0	6	**3**
7		Comprehension	EEC	4	0	0	4	**2**
8		Project Work	EEC	12	0	0	12	**6**

List of Professional Electives Courses

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
Professional Elective I								
1	21ME6701	Applied Hydraulics and Pneumatics	6	3	0	0	**3**	
2	21ME6702	Design of Jigs, Fixtures and Press Tools	6	3	0	0	**3**	
3	21ME6703	Additive Manufacturing	6	3	0	0	**3**	
4	21ME6704	Polymer Technology	6	3	0	0	**3**	
5	21ME6705	Advanced I.C. Engines	6	3	0	0	**3**	
5	21ME6706	Alternative fuels	6	3	0	0	**3**	
Professional Elective II								
1	21ME6707	Mechanical Vibrations and Controls	6	3	0	0	**3**	
2	21ME6708	Finite Element Analysis	6	3	0	0	**3**	
3	21ME6709	Mechanical Behaviour of Materials	6	3	0	0	**3**	
4	21ME6710	Design for Manufacturing and Assembly	6	3	0	0	**3**	
5	21ME6711	Composite Materials and Engineering	6	3	0	0	**3**	
6	21ME6712	Modern Machining Processes	6	3	0	0	**3**	
7	21ME6713	Computer Integrated Manufacturing	6	3	0	0	**3**	
8	21ME6714	Air Breathing Engines	6	3	0	0	**3**	
9	21ME6715	Refrigeration and Air Conditioning	6	3	0	0	**3**	
10	21ME6716	Gas Dynamics and Jet Propulsion	6	3	0	0	**3**	
11	21ME6717	Design of Heat Exchanger	6	3	0	0	**3**	
Professional Elective III								
1	21ME7701	Design of Pressure Vessels & Piping	7	3	0	0	**3**	
2	21ME7702	Design and Analysis of Experiments	7	3	0	0	**3**	
3	21ME7703	Reverse Engineering	7	3	0	0	**3**	
4	21ME7704	Flexible Manufacturing Systems	7	3	0	0	**3**	
5	21ME7705	Rapid Prototyping	7	3	0	0	**3**	
6	21ME7706	Welding Technology	7	3	0	0	**3**	
7	21ME7707	Computational Fluid Dynamics	7	3	0	0	**3**	
8	21ME7708	Automobile Engineering	7	3	0	0	**3**	
9	21ME7709	Energy Conservation and Waste heat recovery	7	3	0	0	**3**	
10	21ME7710	Turbo Machinery	7	3	0	0	**3**	
11	21ME7711	Advanced Thermodynamics	7	3	0	0	**3**	
Professional Elective IV								
1	21ME7712	Maintenance Engineering	7	3	0	0	**3**	
2	21ME7713	Total Quality Management	7	3	0	0	**3**	
3	21ME7714	Process Planning and Cost Estimation	7	3	0	0	**3**	
4	21ME7715	Industrial Robotics	7	3	0	0	**3**	

Professional Elective V								
6	21ME7716	Failure Analysis and Design	7	3	0	0	**3**	
7	21ME7717	Precision Machine Design	7	3	0	0	**3**	
8	21ME7718	Industrial Tribology	7	3	0	0	**3**	
9	21ME7719	Non Destructive Testing	7	3	0	0	**3**	
10	21ME7720	Precision Manufacturing	7	3	0	0	**3**	
Professional Elective VI								
1	21ME8701	Industrial Engineering & Management	8	3	0	0	**3**	
2	21ME8702	Lean Six Sigma	8	3	0	0	**3**	
3	21ME8703	Production Planning and Control	8	3	0	0	**3**	
4	21ME8704	Industry 4.0	8	3	0	0	**3**	
5	21ME8705	Entrepreneurship Development	8	3	0	0	**3**	
6	21ME8706	Fundamentals of Combustion	8	3	0	0	**3**	
7	21ME8707	Nuclear Engineering	8	3	0	0	**3**	
8	21ME8708	Cryogenics	8	3	0	0	**3**	

List of Open Electives Courses (issued as a separate supplementary)

Note: The Prerequisite for the courses offered in Open Elective II shall be of any courses offered as Open elective I

Semester I

21GE1101	ENGLISH FOR PROFESSIONAL COMMUNICATION	L	T	P	C
		1	0	2	3

Prerequisites for the course

The prerequisite knowledge required to study this Course is the basic knowledge in English Language.

Objectives

1. To develop listening skills, and enhance the ability of comprehending.
2. To communicate confidently in varied real life situations.
3. To widen the basic reading skills of the first year Engineering and Technology students.
4. To master vocabulary, sentence structure and to write articles.
5. To create emotional awareness.

Module I	SHARING BASIC INFORMATION	9

Listening - listening to basic technical concepts, short formal and informal conversations; **Speaking**- Formal Self-Introduction – Etiquette – Phrases to be used highlighting the characteristics, strengths and weaknesses - Conversation Practice; **Reading** - short comprehension passages on fundamental concepts, principles, and ideas that helps to understand the need of Technology in a rapidly changing global environment; **Writing** - restructuring sentences from the jumbled words – creating coherence; **Language development** - Framing Yes/No questions, Question tag, **Vocabulary development** - formation of words– verb – Noun – Adjectives, Standard Abbreviations related to Engineering.

Suggested Activities	**Evaluation Method**
i) Listening to Conversations from suggested **app/prescribed modules** - Submission of 5 Recorded Conversations.	**i) Listening & Speaking:** Submitted Conversation will be assessed for a) Language style as that of the sample audio. b) Pronunciation c) Intonation
ii) Introducing oneself to the audience in a professional way - Video Recording to be submitted.	**ii) Introduction:** Submitted Video Recording will be assessed for a) Communication Etiquette b) Language Style c) Sentence Construction
iii) Reading 3 Passages on Technology and answering questions through google forms. iv) Rearranging Jumbled words - Exercises v) Teaching of Grammar Contents	**Activities iii to v** will be assessed through google form tests/ written tests.

Module II	**SHARING TECHNICAL INFORMATION**	**9**

Listening - Listening to technical lectures by native speakers; **Speaking** - introducing a device/gadget to the audience – giving importance to its specifications, descriptions, merits and demerits; **Reading** -extensive reading – short narratives and news items from newspapers related to technology; **Writing** - sentence structure – short passages / reviews on any gadget – describing an electronic/ mechanical gadget, importance of punctuation, organizing paragraphs; **Language development** -framing 'Wh' Questions, writing a complete sentence using the fragments given; **Vocabulary development**- prefix and suffix.

Suggested Activities	**Evaluation Method**
i) Listening to Technical Lectures - Suggested Youtube channels a) Learn Engineering b) Jared Owen c) Interesting Engineering d) Practical Engineering	**i) Listening skills will be tested through through** a) MCQs - Google Forms - 3 Sets b) Quiz - Polling - 2 set
ii) Speaking / submitting video recording / classroom presentation about an electronic/electrical/ a mechanical gadget giving importance to its specifications, descriptions, merits and demerits.	**ii)Speaking:** Submitted Video Recording/Presentation during class hours will be assessed for a) Language Style & Fluency b) Creation of Google Slides / Canva Slides c) Content delivery
iii) Reading articles from Newspaper/ Google News / Times Now / and other Tech News Sites iv) Writing reviews of a product v) Teaching of Grammar Contents	**Activities iii to v** will be assessed through google form tests/ written tests.

Module III	**UNDERSTANDING TECHNOLOGY**	**9**

Listening - listening to technical talks on emerging trends and filling in the blanks – cloze test; **Speaking** - asking for opinions about technical gadgets – presentation of reviews on electronic/electrical/mechanical/software products; **Reading** - Reading Comprehension – technical passages – Articles from journals; **Writing** - rearranging jumbled sentences, writing short essays; **Language development** - Direct Speech and Indirect Speech – Framing Indirect – Questions - Prepositions – Articles; **Vocabulary development** – select Single Word Substitutes used in Engineering.

Suggested Activities	**Evaluation Method**
i) Listening to Technical talks on emerging trends - Suggested Youtube channels a) Bernard Marr b) Concerning Reality c) Ideas and Inspiration	**i) Listening skills will be tested through through** a) Cloze Test - 2 Sets

ii) Speaking / submitting video recording / classroom presentation on giving reviews about a product. iii) Reading articles -Extracts from reputed journals. iv) Writing essays and rearranging Jumbled Sentences. v) Teaching of Grammar Contents	**ii)Speaking:** Submitted Video Recording/classroom presentation will be assessed for a) Inquisitiveness b) Analytical skills c) Presentation Skills **Activities iii to v** will be assessed through google form tests/ written tests.

Module IV	**STATING PROBLEMS AND EXPRESSING SOLUTIONS**	**9**

Listening- listening to talks relating to technology and noting down the merits and demerits; **Speaking** - stating a problem and expressing solutions giving more focus on pronunciation of words and sentence structure; **Reading** - comprehending Articles from Magazines – Identify the problem statement and note down solution statements; **Writing** - Identifying problems – Writing problem statement, Analyzing the situation – Gathering information related to the problem stated – Identifying solution criteria – Choosing the best solution – Implementing a solution – writing solution content - Measuring solution success – Report preparation – White paper writing – Release/launch notes; **Language development**- Tenses; **Vocabulary development**- Synonyms, Antonyms, Phrasal Verbs.

Suggested Activities	**Evaluation Method**
i) Listening to talks related to Technology - Suggested Youtube channels a) Auto Car India b) Lesics c) Student Energy ii) Speaking / submitting video recording / classroom presentation on Technical issues faced in a gadget and expressing suitable solutions. iii) Reading articles -Extracts from reputed journals and identify problem statements and solution statements. iv) Writing - Identifying problems – Writing problem statement, Analyzing the situation – Gathering information related to the problem stated – Identifying solution criteria –	**i) Listening skills will be tested through through** a) Note making - 2 Sets **ii)Speaking:** Submitted Video Recording / Classroom Presentation will be assessed for a) Expression of Innovative Ideas and Solution b) Sentence Structure **Activities iii to v** will be assessed through google form tests/ written tests/ written exercises.

Choosing the best solution – Implementing a solution – writing solution content - Measuring solution success – Report preparation – White paper writing – Release/launch notes v) Teaching of Grammar Contents	

Module V	**EMOTIONAL AWARENESS AND MANAGEMENT**	**9**

Listening - Listening Types - Appreciative listening – Critical Listening – Relationship Listening; **Speaking** - presentation on the importance of Emotional Intelligence; **Reading**- Reading articles on High Level Cognition - Cognitive Control – Decision Making – Social Behaviour – Emotion – Language and Consciousness; **Writing** - Articulate emotions using the right language - Balance optimism and pessimism to effectively impact others; **Language development** - modal verbs; **Vocabulary development** - Fixed and Semi-Fixed Expressions.

Suggested Activities	**Evaluation Method**
i) Watching videos on types of Listening	**i) Listening skills will be tested through through** a) Google form test- 2 Sets
ii) Presentation on Emotional Intelligence	**ii)Speaking:** Submitted Video Recording / Classroom Presentation will be assessed for a) Emotional awareness b) Communication Skills
iii) Reading articles on High Level Cognition iv) Writing - Articulate emotions using the right language - Balance optimism and pessimism to effectively impact others v) Teaching of Grammar Contents	**Activities iii to v** will be assessed through google form tests/ written tests/ written exercises.

S.No	**List of Experiments**	**CO'S**
1.	Conversation Recording using the suggested app	CO 1
2.	Self Introduction Video	CO 1
3.	Listening Test - Google Form	CO 2
4.	Presentation on the working principle of a gadget	CO 2
5.	Listening - Cloze Test	CO 3
6.	Reviewing a Product - Video Submission	CO 3
7.	Listening and Note Making	CO 4
8.	Talk on technical issues in a gadget and express suitable solutions.	CO 4
9.	Types of Listening - Google Form	CO 5

10.	Presentation on Emotional Intelligence	CO 5
Total Periods		**15 Theory +30 Lab**

Laboratory Requirements for a batch of 60 Students

Software: Globarena

1. Teacher console and 60 systems for students.
2. English Language Lab Software
3. Career Lab Software

Suggestive Assessment Methods:

1. Listening and answering questions - MCQ - Cloze Test - Note Making
2. Speaking - App/Software based testing
3. Reading - analyze the passage given - understand the concept and answer Questions - On-line Based
4. Written Tests

Continuous Assessment Test (30 Marks)	**Lab Components Assessments (10 Marks)**	**End Semester Exams (50 Marks)**
Written Examination	Completion of Suggested Exercises	Written Examination

Outcomes

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

CO1: Enumerate basic information using communication etiquette on par with international communication standards.

CO2: Interpret fundamental technical concepts in English language giving importance to syntax.

CO3: Evaluate advanced varied technical concepts in the current scenario and emerging trends to invent new concepts.

CO4: Write solutions for problems identified using the exact vocabulary and structure without grammatical errors as expected by the corporate world.

CO5: Manage and respond to self, others' emotions using skills of Self Awareness, Self Management, Self-Motivation, Empathy & Social Relations to be an Emotionally Intelligent Human Being.

Text Books

1. Butterfield, Jeff. Soft Skills for Every one. Cengage Learning: New Delhi,2017.
2. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

Reference Books

1. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges.
3. Cengage Learning, USA: 2007

Web Resources

1. Interpretation of Charts :https://youtu.be/4lxA7lo9GLU : https://www.englishhints.com/charts-and-graphs.html

2. Instructions https://www.wikihow.com/Write-Clear-Instructions
3. Resume building https://novoresume.com/career-blog/how-to-write-a-resume-guide
4. Report writing - https://www.youtube.com/watch?v=FXIuHOFAxos ; https://www.deakin.edu.au/students/studying/study-support/academic-skills/report-writing

CO Vs PO Mapping and CO Vs PSO Mapping

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

Assessment Pattern

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT - 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	30	10	10	30
APPLY	60	60	10	10	60
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) :Enumerate basic information using communication etiquette on par with international communication standards.

1) Listen to the talk on basic technical topics and answer the questions provided.
2) Introduce yourself in a professional way highlighting Characteristics, Strengths & Weaknesses.
3) Converse with your friend on any fundamental concepts in Technology.
4) Read the given technical passage and answer the questions provided.
5) Frame Yes/No Questions for the statements given.
6) Frame Question tags for the statements given.
7) Rearrange the jumbled words into a meaningful sentence.
8) Complete the sentence with the Noun form/ Verb Form/ Adjective form (as Directed) of the word given.
9) Give the expansion of the Abbreviations given.

COURSE OUTCOME 2 (CO 2) :Interpret fundamental technical concepts in English language giving importance to syntax.

1) Listen to the technical lecture and answer the questions provided.
2) Introduce a device or a gadget to the class giving importance to its specifications, description, merits and demerits.

3) Read the given passage / short narrative / article from a journal or newspaper to the class.
4) Write your review on any one of the gadgets you are using.
5) Frame "Wh" Questions for the statements given.
6) Punctuate the following statement given.
7) Complete the sentence using the fragments given.
8) Write a short passage on the given topic.
9) Fill in the blanks with the suitable prefix or suffix as directed.

COURSE OUTCOME 3 (CO 3) :Evaluate advanced varied technical concepts in the current scenario and emerging trends to invent new concepts.

1) Listen to the technical talk on the emerging trends and complete the statements given. (Cloze Test)
2) Ask questions to get an opinion about technical gadgets / software / device
3) Read the given article from a journal and provide your ideas for further developments.
4) Rearrange the following sentences in the proper chronological order.
5) Write a short essay on any one of the given technical topics highlighting the future scope of the product.
6) Rewrite the following into Indirect Speech.
7) Frame indirect questions for the questions given.
8) Fill in the blanks with the suitable articles.
9) Give the one word substitutes for the given statement.

COURSE OUTCOME 4 (CO 4) :Write solutions for problems identified using the exact vocabulary and structure without grammatical errors as expected by the corporate world.

1) Listen to the technical talks and write down the merits and demerits of the product discussed.
2) Watch the video, evaluate the concept and express your solutions to the problem.
3) Read the given article and note down the problems stated.
4) Write down solutions for the problems faced while using a product.
5) Draft a white paper writing for the given situation..
6) Write launch notes for a product.
7) Convert the given statement to another form of the tenses as directed.
8) Pick out the suitable synonym for the underlined word in order to minimize plagiarism.
9) Fill in the blank with the suitable phrasal verb.

COURSE OUTCOME 5 (CO 5) :Manage and respond to self, others' emotions using skills of Self Awareness, Self Management, Self Motivation, Empathy & Social Relations to be an Emotionally Intelligent Human Being.

1) Watch the video on Types of listening and answer the questions.
2) Make a presentation on the importance of Emotional Intelligence.
3) Read the given article on High level cognition and answer the questions.
4) Read the article on social behaviour and redraft it in your own style.
5) Comprehend the passage and give your inputs for decision making.
6) Watch the video and articulate your emotions using appropriate words.
7) Write a note on optimism and pessimism.
8) Fill in the blank with the suitable modal verb.
9) Pick out the suitable fixed/ semi-fixed expression to complete the given statement.

Concept Map

ENGLISH FOR PROFESSIONAL COMMUNICATION

LISTENING

- Listening to Conversations.
- Listening to Basic Concepts in Engineering.
- Listening to talks on emerging trends.
- Listening to talks on merits and demerits of a product.
- Listening to Types of Listening.

SPEAKING

- Formal Introduction.
- Conversation Practice.
- Introducing a device to the audience.
- Stating a problem and expressing solutions.
- Presentation on Emotional Intelligence.

READING

- Reading passages on fundamental Concepts in Engineering.
- Reading articles from newspapers.
- Reading articles from Magazines and Journals.
- Reading articles to identity problem statements and solution statements.
- Reading articles on High-Level Cognition and Social Behaviour.

WRITING

- Rearranging Jumbled words.
- Writing Reviews.
- Writing short Essays.
- Writing Problem Statements, Solution statements and Launch Notes
- Articulate emotions using the exact words.

LANGUAGE DEVELOPMENT

- Yes/No Questions
- Question tag
- 'Wh' questions
- Direct and Indirect Speech
- Indirect Questions
- Prepositions
- Articles
- Tenses
- Modal verbs

VOCABULARY DEVELOPMENT

- Word Formation
- Abbreviations
- Prefix & Suffix
- Single Word Substitutes
- Synonyms & Antonyms
- Phrasal Verbs
- Fixed and Semi-Fixed Expressions

COURSE CONTENT AND LECTURE SCHEDULE

S.No	Topic	No. of Hours Required
	UNIT I (9 Hrs)	
1.	Listening to basic Technical Concepts	1
2.	Formal & Informal Conversation	1
3.	Formal Self Introduction	1
4.	Conversation Practice	1
5.	Reading Short Technical Passages	1
6.	Jumbled words / Sentences	1
7.	Yes/No questions and Question tag	1
8.	Formation of Words	1
9.	Standard Abbreviations related to Engineering.	1
	UNIT II (9 Hrs)	
10.	Listening to technical lectures by native speakers	1
11.	Introducing a device/gadget to the audience	1
12.	Extensive Reading	1
13.	Reading short narratives and news items from newspapers related to technology	1
14.	Writing reviews on any gadget – describing an electronic/ mechanical gadget	1
15.	Importance of punctuation, organizing paragraphs	1
16.	'Wh' Questions	1
17.	writing a complete sentence using the fragments given	1
18.	Prefix and Suffix	1
	UNIT III (9 Hrs)	
19.	Listening to technical talks on emerging trends and filling in the blanks – cloze test	1
20.	asking for opinions about technical gadgets – presentation of reviews on electronic/electrical/mechanical/software products	1
21.	Reading Comprehension – technical passages – Articles from journals	1
22.	Rearranging jumbled sentences, writing short essays	1
23.	Direct Speech and Indirect Speech	1
24.	Framing Indirect Questions	1
25.	Prepositions	1
26.	Articles	1
27.	One word Substitute	1
	UNIT IV (9 Hrs)	
28.	Listening to talks relating to technology and noting down the merits and demerits	1
29.	Stating a problem and expressing solutions giving more focus on pronunciation of words and sentence structure	1
30.	Reading and comprehending Articles from Magazine	1
31.	Identify the problem statement and note down solution statements	1
32.	Writing Solution Statements	1
33.	Writing White Paper and Launch Notes	1
34.	Tenses	1
35.	Synonyms & Antonyms	1

36.	Phrasal Verbs	1
	UNIT V (9 Hrs)	
37.	Types of Listening	1
38.	Presentation on Emotional Intelligence	1
39.	Reading Articles on High Level Cognition	1
40.	Decision making and Social behavior	1
41.	Emotion - language and Consciousness	1
42.	Articulating Emotions - Using the right Language	1
43.	Balance between Optimism and Pessimism	1
44.	Modal Verbs	1
45.	Fixed and Semi-fixed Expressions	1
	TOTAL	**45**

HoD/Mech

21GE1201	MATRICES AND ADVANCED CALCULUS	L	T	P	C
		3	1	0	4

Prerequisites for the course:

Students should have basic knowledge about matrices, differentiation and integration.

Objectives

1. To apply advanced matrix knowledge to Engineering problems
2. To familiarize with the applications of differential equations.
3. To equip themselves familiar with the functions of several variables
4. To have Knowledge in Multiple integrals
5. To improve their ability in Vector calculus.

UNIT I	MATRICES	9

Linear Algebra-Linear Equation-Matrices -Characteristic equation – Eigen values and Eigen vectors of a symmetric and non symmetric matrix – Properties of Eigen values and Eigen vector – Cayley – Hamilton theorem and its applications.

UNIT II	ORDINARY DIFFERENTIAL EQUATIONS	9

Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Legendre's equations – Methods of Variation parameter**.**

UNIT III	FUNCTION OF SEVERAL VARIABLE	9

Function of two variables – Partial derivatives– Taylor's expansion for two variables – Maxima and Minima for two variables–Jacobians – Euler's theorem for homogeneous function

UNIT IV	MULTIPLE INTEGRALS	9

Double integration in Cartesian and polar coordinates– Area as a double integral – Triple integration in Cartesian coordinates– Volume as a Triple Integral

UNIT V	VECTOR CALCULUS	9

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities (without proof) – Directional derivatives–Green's, Gauss divergence and Stoke's theorems (without proof).

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1.Descriptive Type Questions 2..Formative Multiple Choice Questions	1.Assignment 2.Online Quizzes 3.Problem –Solving Activities	1.Descriptive Type Questions 2.Formative Multiple Choice Questions

Outcomes

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

CO1:Find the inverse and the positive powers of a square matrix

CO2: Predict the suitable method to solve second and higher order differential equations

CO3: Find the maxima and minima for a given function with several variables, through by finding stationary points

CO4: Demonstrate the use of double and triple integrals to compute area and volume.

CO5: Apply the concepts of Differentiation and Integration to Vectors.

Text Books

1. B. S. Grewal, " Higher Engineering Mathematics", 435rd edition, 2017.

Reference Books

1. . A Textbook of Engineering Mathematics(Dr. A.P.J. Abdul Kalam Technical University, Lucknow) (For . Gautam Bhudh technical Universities ,Lucknow) January 2020
2. 2. K. Ganesan, Sundarammal Kesavan, K. S. Ganapathy Subramanian & V. Srinivasan, "Calculus and Solid Geometry", Revised Edition, 2017

Web Recourses

1. https://studentsfocus.com/ma8151-em-1-notes-engineering-mathematics-i-handwritten-notes-1st-sem

MAPPING WITH PROGRAM OUTCOMES:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	PSO 2	PSO3
1	2	1	2									2			
2	2	1	2									2			
3	2	1	2									2			
4	2	1	2									2			
5	2	1	2									2			
6	2	1	2									2			

BLOOOMS LEVEL ASSESSMENT PATTERN

BLOOM'S CATEGORY	CONTINUOUS ASSESSMENT TESTS		END SEMESTER EXAMINATION
	CAT – 1	CAT -2	
REMEMBER	10	10	10
UNDERSTAND	30	30	30
APPLY	60	60	60
ANALYZE	0	0	0
EVALUATE	0	0	0
CREATE	0	0	0

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 (CO 1) :

1) Compute the eigen values and eigen vectors for the Symmetric matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

2) Find A^{-1} and A^4using Cayley Hamilton Theorem for the matrix

$$A = \begin{bmatrix} 1 & -1 & 4 \\ 3 & 2 & -1 \\ 2 & 1 & -1 \end{bmatrix}.$$

COURSE OUTCOME 2 (CO 2) :

1. Predict the solution of $(x^2D^2 - xD + 1)y = \sin(\log x)$
2. Solve $(D^2 + a^2)\, y = \tan ax$ by using method of variation of parameters.

COURSE OUTCOME 3(CO 3) :

1. Find the extreme values of the function $f(x, y) = x^3 + y^3 - 12x - 3y + 20$.
2. Discuss the maxima and minima of the function $f(x, y) = x^2y^2\,(1-x-y)$.

COURSE OUTCOME 4(CO 4) :

1)Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

2) Evaluate $\int_0^a \int_0^b \int_0^c xyz\, dz\, dy\, dx$

COURSE OUTCOME 5(CO 5) :

1) Find the directional derivative of $\emptyset = xy^2 + yz^3$at the point (2,-1,1) in the direction of $\vec{\imath} + 2\vec{\jmath} + 2\vec{k}$.
2) If $f = x^2 + y^2 + z^2$then find grad $\emptyset$ at (1,-1,1).

COURSE OUTCOME 6(CO 6) :

1) Using Green's theorem , find $\int_C (x^2 - y^2)dx + 2xydy$ where C is the boundary of the rectangle in the XOY-plane bounded by the lines $x = 0, x = a, y = 0, y = b$.

2) Verify Stoke's theorem for the function $\vec{F} = (x^2 - y^2)\vec{\imath} + 2xy\vec{\jmath}$ in the rectangular region in the XOY plane bounded by the $x = 0, x = a,\ y = 0, y = a$.

COURSE CONTENTS AND LECTURE SCHEDULE

S. No	TOPIC	NO.OF LECTURES
I	**MATRICES**	
1	Introduction	1
2	System of Linear Equations	1
3	Characteristic Equation	1
4	Eigen values	1
5	Eigen values and Eigen vectors of a non symmetric matrix	1

6	Eigen valuesand Eigen vectors of a symmetric matrix	1
7	Properties of Eigen values and Eigen vectors	1
8	Cayley Hamilton theorem	1
9	Problems Using Cayley Hamilton theorem	1
II	**ORDINARY DIFFERENTIAL EQUATIONS**	
10	Introduction -Ordinary Differential Equation	1
11	ODE - TYPE 1	1
12	ODE - TYPE 2	1
13	ODE - TYPE 3	1
14	ODE - TYPE 4	1
15	ODE - TYPE 5	1
16	Homogeneous equation of Euler type	1
17	Legendre's equations	1
18	Methods of Variation parameter	1
III	**FUNCTIONS OF SEVERAL VARIABLES**	
19	Introduction - Function of two variables	1
20	Partial derivatives	1
21	Taylor's expansion	1
22	Maxima and Minima	2
23	Jacobians	2
24	Euler's theorem for homogeneous function	2
IV	**MULTIPLE INTEGRALS**	
25	Double integration in Cartesian coordinates	2
26	Double integration in Polar coordinates	1
27	Area As Double Integral	2
28	Triple Integration in Cartesian Coordinates	2
29	Volume as Triple Integral	2
V	**VECTOR CALCULUS**	
30	Gradient, Divergence, Curl	1
31	Solenoidal, Irrotational field	1
32	Vector Identities	1
33	Directional Derivatives	1
34	Green's theorem	2
35	Gauss Divergence theorem	2
36	Stoke's theorem	1
	TOTAL HOURS	**45**

COURSE DESIGNERS :

1) **Mr. A. Santiago Stephen** **santiagostephen@francisxavier.ac.in**
2) **Mrs. N. Jeya Sree** **jeyashreen@francisxavier.ac.in**
3) **Ms. A. Reshiya** **reshiya@francisxavier.ac.in**

HoD/Mech

21GE1302	ENGINEERING PHYSICS (COMMON TO MECH & CIVIL)	L	T	P	C
		3	0	0	3

Prerequisites for the course

Students should have Basic theoretical concepts of Physics in XI and XII.

Objectives

1. To inculcate the knowledge on the properties of matter
2. To inculcate the knowledge on the modes of heat transfer
3. To introduce the concepts and applications of acoustics and ultrasonic
4. To impart knowledge of crystal structure
5. To explore the knowledge on the preparation and their application of advanced engineering materials.

UNIT I	PROPERTIES OF MATTER	9

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram - Factors affecting elasticity - Mechanisms of plastic deformation- slip and twinning -role of dislocation in slip - Twisting couple - Torsion pendulum -Determination of rigidity modulus- Moment of inertia of a body (regular)- Bending of beams - Bending moment - cantilever -Theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders.

UNIT II	THERMAL PHYSICS	9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints – bimetallic strips – thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity – Forbe's and Lee's disc method: theory and experiment – conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters

UNIT III	ACOUSTICS AND ULTRASONICS	9

Classification of Sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination-Sound absorbing materials – factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - Detection of ultrasonics-Engineering applications of Ultrasonics -Non-destructive testing- Pulse echo technique- cavitation

UNIT IV	SOLID STATE PHYSICS	9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter – planar distances – coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures – crystal imperfections: point defects, line defects – Burger vectors, stacking faults

UNIT V	ADVANCED ENGINEERING MATERIALS	9

Metallic glasses: Types, Glass forming ability of alloys, melt spinning process and applications. Shape memory alloys (SMA): Phase, shape memory effect, pseudo elastic effect NiTi alloy, application. Nanomaterials: Preparation (bottom up and top down approaches) – properties and applications –Carbon nanotubes: Types, properties and applications.

	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Description Questions 2. Formative Multiple Choice Questions	1. Assignment 2. Online Quizzes 3. Problem-Solving Activities	1. Description Questions 2. Formative Multiple Choice Questions

Outcomes

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

CO1:Understand the concept of elasticity, stress, strain and bending moments as well as Uniform and non-uniform bending in beams.

CO2: Mention the applications in expansion joints and heat exchangers.

CO3: Explain the factors to be considered in order to maintain a comfortable inside the building.

CO4: Comprehend the use of concepts of physics for non destructive testing and its application to engineering.

CO5: Describe some important crystal structures and elucidate the different types of crystal Imperfections.

CO6: Explain the properties, performance of engineering materials and its applications.

Text Books

1. Pandey, B.K. & Chaturvedi, S. ―Engineering Physics-I.Cengage Learning India2018.
2. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, (2015)
3. Dr.P.Mani, Dhanam Publication "Engineering Physics-I", Dhanam Publications, (2018)

Reference Books

1. Sankar, B.N., Pillai.S.O., Engineering Physics I, New Age International (P) Ltd., 2015.
2. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, (2015)
3. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications, 2015 Raghavan, V. "Materials Science and Engineering: A First course". PHI Learning,2015

Web Recourses

1. https://www.brainkart.com/subject/Engineering-Physics_263/
2. https://en.wikipedia.org/wiki/Thermal_physics
3. https://www.tce.edu/sites/default/files/PDF/RV3-ACOUSTICS-ULTRASONICS.pdf
4. https://vlab.amrita.edu/?sub=1&brch=282&sim=370&cnt=1
5. https://www.brainkart.com/article/Advanced-Engineering-Materials-Metallic-Glasses_6815/

CO Vs PO Mapping and CO Vs PSO Mapping

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

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDETSTSND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Understand the concept of elasticity, stress, strain and bending moments as well as Uniform and non-uniform bending in beams. (Understand)

1. Derive the expression for the depression at the free end of a cantilever due to load. Describe an experiment to determine the young's modulus of the cantilever using this expression.
2. Give the theory of torsional pendulum and describe a method to find the moment of inertia of an irregular body.
3. How will you determine the young's modulus of material of a bar by non-uniform bending method? Explain briefly the theory behind the determination of young's modulus.

COURSE OUTCOME 2: Mention the applications in expansion joints and heat exchangers. (Apply)

1. What is heat exchanger? Explain in detail about heat exchangers.
2. Derive an expression for the quantity of heat flow through a metal slab whose faces are kept at two different temperatures. Use this expression to determine the thermal conductivity of a bad conductor.
3. The total area of a glass window pane is 0.8 m^2. Calculate how much heat is conducted per hour through the glass window pane if thickness of glass is 3 mm. The temperature of the inside surface is 25 °C and outside surface is 4 °C. The thermal conductivity of glass is 1.1 Wm-1K-1

COURSE OUTCOME 3: Explain the factors to be considered in order to maintain a comfortable inside the building. (Apply)

1. Derive expressions for growth and decay of energy density inside a hall and hence deduce sabine's formula for the reverberation time of the hall.
2. Discuss the factors, reverberation, resonance, echelon effect, and focussing that affect the acoustics in a hall and the remedies for them.

3. Calculate the increase in the acoustic intensity level when the sound intensity is doubled.

COURSE OUTCOME 4: Comprehend the use of concepts of physics for non destructive testing and its application to engineering. (Apply)

1. Explain with the help of a neat sketch the construction and production of ultrasonic waves using piezoelectric oscillator.
2. Mention the methods of detecting ultrasonic waves.
3. Explain the process of non–destructive testing of materials using ultrasonic waves by pulse echo overlap method.

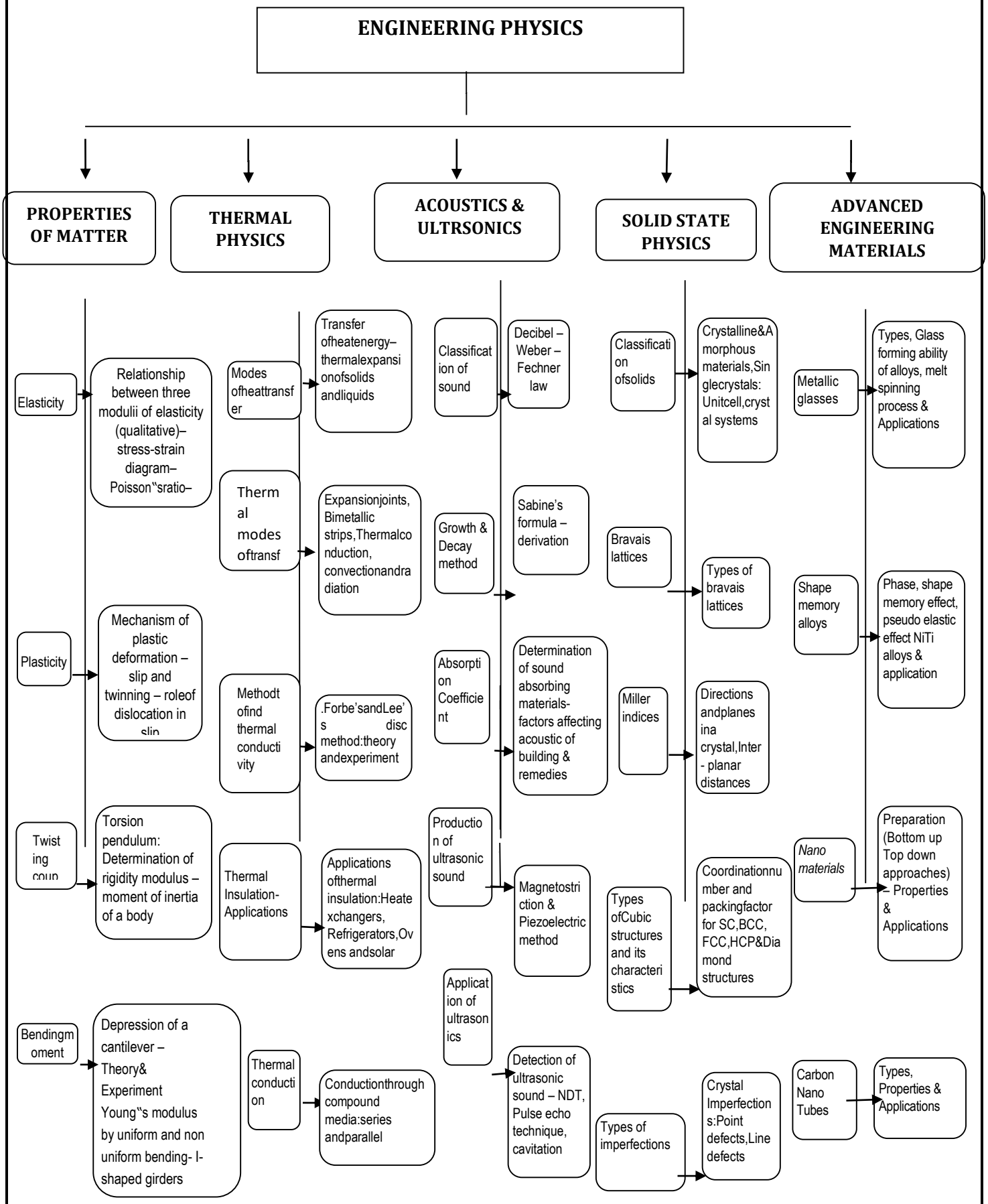
COURSE OUTCOME 5: Describe some important crystal structures and elucidate the different types of crystal Imperfections. (Understand)

1. Describe BCC structure. Derive expression for the number of atoms, co-ordination number, atomic radius and packing factor.
2. What is meant by crystal defects? Explain the various types of crystal defects with neat diagram.
3. Explain the role of imperfections in plastic deformation.

COURSE OUTCOME 6:Explain the properties, performance of engineering materials and its applications. (Understand)

1. Explain the preparation, types, properties and application of metallic glasses.
2. Describe the properties and applications of shape memory alloys.
3. Describe the carbon nano tubes with properties and applications.

CONCEPT MAP


ENGINEERING PHYSICS
PROPERTIES OF MATTER
THERMAL PHYSICS
ACOUSTICS & ULTRSONICS
SOLID STATE PHYSICS
ADVANCED ENGINEERING MATERIALS
Elasticity
Relationship between three modulii of elasticity (qualitative)– stress-strain diagram– Poisson"sratio–
Plasticity
Mechanism of plastic deformation – slip and twinning – roleof dislocation in slip
Twisting coup
Torsion pendulum: Determination of rigidity modulus – moment of inertia of a body
Bendingmoment
Depression of a cantilever – Theory& Experiment Young"s modulus by uniform and non uniform bending- I-shaped girders
Modes ofheattransfer
Transfer ofheatenergy– thermalexpansionofsolids andliquids
Thermal modes oftransf
Expansionjoints, Bimetallic strips,Thermalconduction, convectionandradiation
Methodtofind thermal conductivity
.Forbe'sandLee's disc method:theory andexperiment
Thermal Insulation-Applications
Applications ofthermal insulation:Heatexchangers, Refrigerators,Ovens andsolar
Thermal conduction
Conductionthrough compound media:series andparallel
Classification of sound
Decibel – Weber – Fechner law
Growth & Decay method
Sabine's formula – derivation
Absorption Coefficient
Determination of sound absorbing materials-factors affecting acoustic of building & remedies
Production of ultrasonic sound
Magnetostriction & Piezoelectric method
Application of ultrasonics
Detection of ultrasonic sound – NDT, Pulse echo technique, cavitation
Classification ofsolids
Crystalline&Amorphous materials,Singlecrystals: Unitcell,crystal systems
Bravais lattices
Types of bravais lattices
Miller indices
Directions andplanes ina crystal,Inter - planar distances
Types ofCubic structures and its characteristics
Coordinationnumber and packingfactor for SC,BCC, FCC,HCP&Diamond structures
Types of imperfections
Crystal Imperfections:Point defects,Line defects
Metallic glasses
Types, Glass forming ability of alloys, melt spinning process & Applications
Shape memory alloys
Phase, shape memory effect, pseudo elastic effect NiTi alloys & application
Nano materials
Preparation (Bottom up Top down approaches) – Properties & Applications
Carbon Nano Tubes
Types, Properties & Applications

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	PROPERTIES OF MATTER	
1	Introduction-Elasticity - Poisson's ratio and relationship between moduli	1
2	Stress-strain diagram - Factors affecting elasticity	1
3	Mechanisms of plastic deformation- slip and twinning -role of dislocation in slip	1
4	Twisting couple - Torsion pendulum - Determination of rigidity modulus- Moment of inertia of a body	2
5	Bending of beams, bending moment, Cantilever theory and experiment	1
6	Uniform and non- uniform bending: theory and experiment	2
7	I–shaped girders, stress due to bending in beams	1
	THERMAL PHYSICS	
8	Introduction, Transfer of heat energy – thermal expansion of solids and liquids-Modes of heat transfer	1
9	Expansion joints, Bimetallic strips, Thermal conduction, convection and radiation	1
10	Heat conduction in solids, Thermal Conductivity, Thermal insulation	1
11	Forbe's and Lee's disc method: theory and experiment-Method to find thermal conductivity	2
12	Conduction through compound media: series and parallel	1
13	Applications : Heat exchangers, Refrigerators, Ovens and Solar water heaters	2
14	Problems	1

	ACOUSTICS AND ULTRASONICS	
15	Introduction, Velocity, frequency, wavelength, Intensity, loudness (expression), timber, of sound, reflection of sound, echo	1
16	Reverberation, reverberation time, Sabine's formula, remedies over reverberation	2
17	Absorption of sound, absorbent materials; Conditions for good acoustics of a building; Noise, its effects and remedies	1
18	Ultrasonics – Production of ultrasonics by Piezo-electric and magnetostriction	2
19	Detection of ultrasonics	1
20	Engineering applications of Ultrasonics (Non-destructive testing, cavitation)	1
21	Problems	1
	SOLID STATE PHYSICS	
22	Introduction, Classification of solids, Single Crystalline,Poly Crystalline & Amorphous materials, Single Crystals :Unit cell, Crystal systems	1
23	Bravais lattices-Types of bravais lattices	1
24	Directions and planes in a crystal, Miller indices, Inter- planar distances-Description about hkl planes	1
25	Coordination number and packing factor for SC, BCC, FCC structures and characteristics	2
26	HCP & Diamond structures	2
27	Crystal Imperfections: Point defects, Line defects,Burger vectors, Stacking faults	1
28	Problems	1

ADVANCED ENGINEERING MATERIALS

29	Introduction about smart materials	1
30	Metallic glasses: Types, Glass forming ability of alloys, melt spinning process and applications	2
31	Shape memory alloys (SMA): Phase, shape memory effect, pseudo elastic effect NiTi alloy, application.	2
32	Nanomaterials: Preparation (bottom up and top down approaches) – properties and applications	2
33	Carbon nanotubes: Types, properties and applications.	2

HoD/Mech

21GE1401	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Basic theoretical concepts of Chemistry in higher secondary level.

Objectives

1. To equip the students in conversant with boiler feed water requirements, related problems and water treatment techniques.
2. To make the students familiar with the principles of electrochemistry and corrosion.
3. To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
4. To have a thorough understanding on the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
5. To make the students learn the basics of polymer chemistry and mechanism of lubrication.

UNIT I	WATER AND ITS TREATMENT	9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate and calgon conditioning) external treatment – Ion exchange process- desalination of brackish water - Reverse Osmosis.

UNIT II	ELECTROCHEMISTRYAND CORROSION	9

Electrochemical cell - electrode potential- measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types- chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control – material selection and design aspects – electrochemical protection – sacrificial anode method.

UNIT III	PHASE RULE AND ALLOYS	9

Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system – Pattinson's process.

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel.

UNIT IV	ENERGY SOURCES AND STORAGE DEVICES	9

Nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H_2-O_2 fuel cell. Super Capacitors-Types and Applications.

UNIT V	ENGINEERING MATERIALS	9

Polymers: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Preparation, properties and uses of Teflon and Nylon 6,6.

Lubricants: Introduction-classification-mechanism-properties-viscosity index, oiliness, flash and fire points, cloud and pour points. Composites: Definition, types, polymer matrix composites, FRP only Materials for space application – Titanium alloys

Total Periods	45

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1.Descriptive type questions 2.Formative multiple choice questions	1.Assignment 2.Online Quizzes	1.Descriptive type Questions 2.Formative multiple choice questions

Outcomes

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

CO1: Identify primary sources of drinking water and describe water quality Characteristics .

CO2: Summarise the principles of electrochemistry and corrosion

CO3: Describe the heat treatment of alloys and basics of phase rule

CO4: Discover new methods and technologies for energy storage units

CO5: Interpret the basics of polymer chemistry and lubrication.

Text Books

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand &Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" DhanpatRai Publishing Company (P) LTD, New Delhi, 2018
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

Reference Books

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. PrasantaRath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2019.

Web Recourses

1. https://www.wateronline.com/solution/wastewater-treatment
2. https://pubs.acs.org/journal/iecred

CO Vs PO Mapping and CO Vs PSO Mapping

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

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	50	50	50
APPLY	40	40	40	40	40
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to identify primary sources of drinking water and describe water quality characteristics. (Remember)

1. Differentiate temporary and permanent hard water.
2. 50 ml of given water sample consumed 18 ml of EDTA during titration using EBT indicator. 25 ml of same EDTA consumed by 50 ml of standard hard water containing 1 mg of pure $CaCO_3$ per ml. Calculate the hardness of given water samples in ppm.

COURSE OUTCOME2:Students will be able to summarise the principles of electrochemistry and corrosion.(Understand)

1. Compare the mechanisms involved in electrochemical cell and electrolytic cell.
2. Appraise the applications of electrochemical series.
3.

COURSE OUTCOME 3: Students will be able to describe the heat treatment of alloys and basics of phase rule.(Remember)

1. Illustrate phase, component and degree of freedom with example
2. Criticize one component system with phase diagram**.**

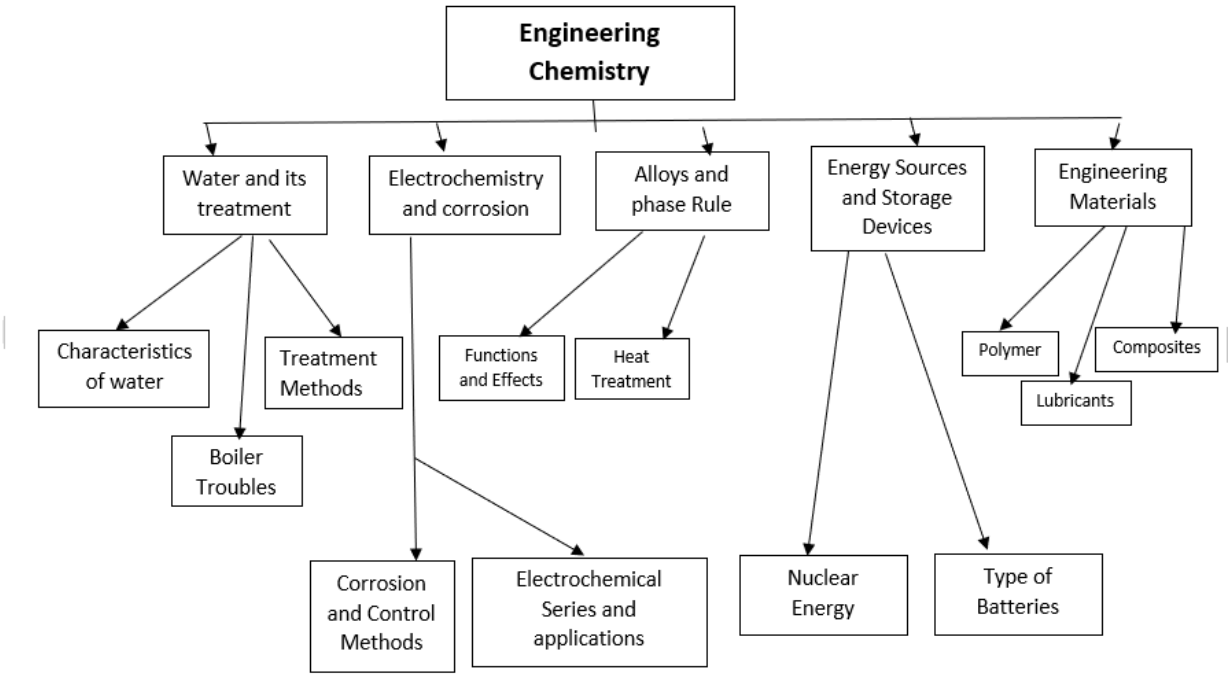
COURSE OUTCOME 4: Students will be able to discover new methods and technologies for energy storage units.(Apply)

1. Sketch lithium ion battery with the help of electrode reactions.
2. Demonstrate the advantages of fuel cell over conventional batteries.

COURSE OUTCOME 5: Students will be able to interpret the basics of polymer chemistry and lubrication. (Understand)

1. Differentiate thermoplastic and thermosetting plastic with example.
2. Demonstrate the preparation properties and uses of Teflon and nylon6.6.

CONCEPT MAP



COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - WATER AND ITS TREATMENT		
1	Hardness of water – types – expression of hardness – units	1
2	Estimation of hardness of water by EDTA	1
3	Numerical problems from EDTA method	1
4	Boiler troubles (scale and sludge)	1
5	Treatment of boiler feed water	1
6	Internal treatment (phosphate conditioning)	1
7	Internal treatment(calgon conditioning)	1
8	External treatment – Ion exchange process	1
9	Desalination of brackish water - Reverse Osmosis	1
UNIT II - ELECTROCHEMISTRYAND CORROSION		
10	Electrochemical cell - electrode potential	1

11	Electrode potential measurement and applications	1
12	Electrochemical series and its significance	1
13	Nernst equation (derivation and problems)	1
14	Corrosion- causes- factors	1
15	Types-chemical corrosion	1
16	Types- electrochemical corrosion (galvanic, differential aeration	1
17	Corrosion control – material selection and design aspects	1
18	Electrochemical protection – sacrificial anode method	1
UNIT III - PHASE RULE AND ALLOYS		
19	Phase rule: Introduction, definition of terms with examples	1
20	One component system -water system	1
21	Reduced phase rule with examples	1
22	Thermal analysis and cooling curves	1
23	Two component systems - lead-silver system – Pattinson's process.	1
24	Alloys: Introduction- Definition- properties of alloys	1
25	Significance of alloying	1
26	Functions and effect of alloying elements- Nichrome and stainless steel (18/8)	1
27	Heat treatment of steel	1
UNIT IV - ENERGY SOURCES AND STORAGE DEVICES		
28	Nuclear fission - nuclear fusion - differences between nuclear fission and fusion	1
29	Nuclear chain reactions - nuclear energy	1
30	Light water nuclear power plant	1
31	Solar energy conversion - solar cells,wind energy	1
32	Types of batteries – primary battery (dry cell)	1

33	Secondary battery (lead acid battery)	1
34	Secondary battery(lithium-ion-battery)	1
35	Fuel cells – H2-O2 fuel cell	1
36	Super Capacitors-Types and Applications.	1
UNIT V - ENGINEERING MATERIALS		
37	Polymers: Classification of polymers – Natural and synthetic	1
38	Thermoplastic and Thermosetting plastics	1
39	Functionality – Degree of polymerization. Properties of polymers: Tg, Tacticity	1
40	Molecular weight – weight average, number average and polydispersity index.	1
41	Preparation, properties and uses of Teflon and Nylon 6,6.	1
42	Lubricants: Introduction-classification-mechanism-properties-viscosity index	1
43	Oiliness, flash and fire points, cloud and pour points.	1
44	Composites: Definition, types, polymer matrix composites, FRP only	1
45	Materials for space application – Titanium alloys	1
	Total	**45**

HoD/Mech

21CS1514	C PROGRAMMING	L	T	P	C
		1	0	4	3

Prerequisites for the course

- Basic Problem-solving ideas, Analytical and Logical thinking

Objectives

1. To learn the basic constructs of C Programming.
2. To learn arrays and strings concepts of C Programming.
3. To learn functions and pointers in C and use pointers for storing data in the main memory efficiently.
4. To learn structures and union concepts of C Programming
5. To learn file processing functions

UNIT I	INTRODUCTION TO PROBLEM SOLVING AND C PROGRAMMING	7

Overview - Problem definition, Understanding and Analysis- Algorithm - properties, representation, - Flowcharts - practical examples - Structure of a 'C' program - C Tokens: Constants, Variables – Data Types: Primitive Data Types, Type Definition, Operators and Expressions

UNIT II	BASICS OF C PROGRAMMING	6

Managing Input and Output operations – Decision Making: Branching statements, Looping statements- Arrays: Declaration, Initialization, One dimensional, Two dimensional, and Multidimensional arrays .

UNIT III	STRINGS, FUNCTIONS AND POINTERS	6

String: String operations – Function : Declaration, Definition, Parameter passing methods, Recursion – Pointers: Declaration, Definition, Pointers and Functions, Pointer to an Array, Pointer to Pointer, Dynamic Memory Allocation

UNIT IV	STRUCTURE AND UNION	6

Structure and union - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Self referential structures - typedef

UNIT V	FILE PROCESSING	5

Files – file input output -Types of file processing: Sequential access, Random access – Example Program: Finding average of numbers stored in sequential access file

S.No	List of Experiments	CO
1	Programs using simple statements	CO1
2	Programs using decision making statements	CO2
3	Programs using looping statements	CO2
4	Programs using one dimensional and two-dimensional arrays	CO2
5	Programs using strings.	CO2
6	Programs using user defined functions and recursive functions	CO3

7	Programs using functions and pointers	CO3
8	From a given paragraph perform the following using built-in functions: a. Find the total number of words. b. Capitalize the first word of each sentence. c. Replace a given word with another word.	CO3
9	Sort the list of numbers using pass by reference.	CO3
10	Generate salary slip of employees using structures and pointers.	CO4,CO5
11	Compute internal marks of students for five different subjects using structures and unions.	CO5
	Total Periods	**30 Theory +30 Lab**

Laboratory Requirements

- C compiler
- System with windows

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**

Outcomes

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

CO1: Apply algorithmic thinking to understand, define and solve problems.
CO2: Develop simple applications in C using basic constructs
CO3: Develop and implement applications in C using functions and pointers and use pointers for storing data in the main memory efficiently.
CO4: Develop applications in C using structures and union.
CO5: Design applications using sequential and random access file processing

Text Books

1. ReemaThareja, "Programming in C",Oxford University Press, Second edition, 2016
2. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited;2017.
3. Anita Goel and Ajay Mittal , "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt.Ltd., Pearson Education in South Asia,2011.

Reference Books

1. Byron Gottfried. Programming With C. Fourth Edition, McGrawHill, 2018.
2. Paul Deital , Harvey deital, "C How to Program" , 8th Edition , Pearson,2016
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2016.

Web Recourses

1. https://www.programiz.com/c-programming
2. https://nptel.ac.in/courses/106105171/
3. https://www.digimat.in/nptel/courses/video/106105171/L01.html

CO Vs PO Mapping and CO Vs PSO Mapping

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

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for….(Apply)

Course Outcome 1 (CO1):

1. Recall the list of symbols used in flowcharts for various purposes. **(Remember)**
2. Summarize the steps involved in exchanging values of variables. **(Understand)**
3. Choose proper selection control structures to solve area of rectangle, triangle and circle. **(Apply)**

Course Outcome 2 (CO2):

1. What is the use of an array? **(Remember)**

2. Show the general form of a typical decision making structure found in C programming language. **(Understand)**

Course Outcome 3 (CO3):

1. Narrate how to apply user-defined function. **(Understand)**
2. Write an algorithm for linear pattern searching. **(Apply)**
3. Develop an algorithm for comparing two strings. **(Apply)**

Course Outcome 4 (CO4):

1. Point out the meaning of array of structures. **(Apply)**
2. How many bytes in memory taken by the following C structure? **(Remember)**

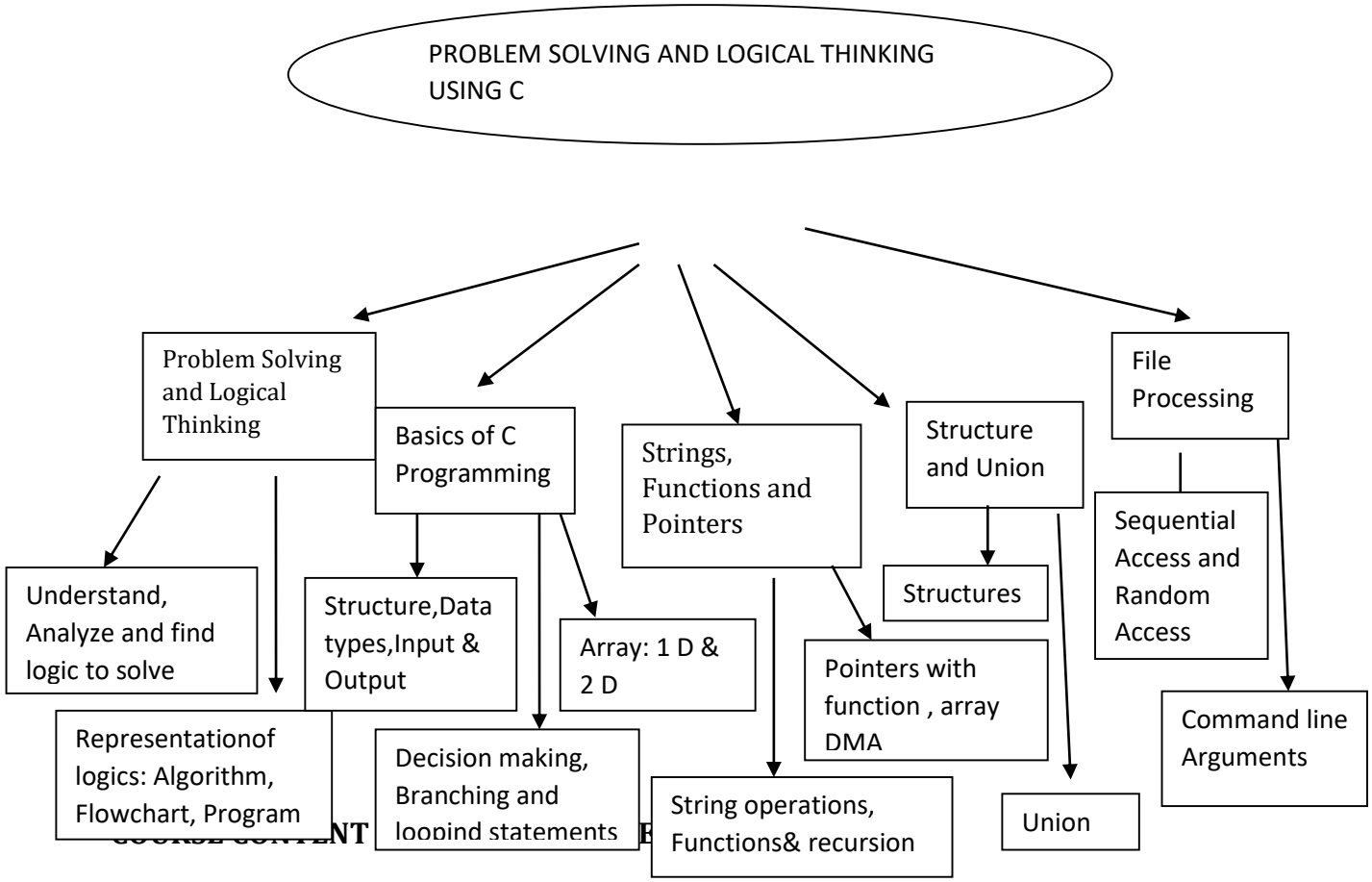
```
#include <stdio.h>
struct test
{ int k;
char c;
};
```

Course Outcome 5 (CO5):

1.Develop a C program to create a text file to store records of addresses of N persons and retrieve and display the records with city="Tirunelveli". **(Apply)**

2.Develop a C program to find average of numbers stored in sequential access file. **(Apply)**

CONCEPT MAP



COURSE CONTENT

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO PROBLEM SOLVING AND C PROGRAMMING		
1	Overview	1
2	Problem definition, Understanding and Analysis	1
3	Algorithm -properties, representation	1
4	Flowcharts - practical examples	1
5	Structure of a 'C' program- C Tokens: Constants, Variables	1
6	Data Types: Primitive Data Types, Type Definition	1
7	Operators and Expressions	1
UNIT II-BASICS OF C PROGRAMMING		
8	Managing Input and Output operations Arrays: Declaration, Initialization, One dimensional, Two dimensional, and Multidimensional arrays .	1
9	Decision Making: Branching statements	1
10	Looping statements	1
11	Arrays: Declaration , Initialization, One dimensional arrays	1
12	Two dimensional arrays .	1
13	Multidimensional arrays .	1
UNIT-III STRINGS, FUNCTIONS AND POINTERS		
14	String: String operations	1
15	Function : Declaration, Definition, Parameter passing methods,	1
16	Recursion, Pointers: Declaration, Definition	1
17	Pointers and Functions	1
18	Pointer to an Array, Pointer to Pointer,	1

19	Dynamic Memory Allocation	1
UNIT-IV STRUCTURE AND UNION		
20	Structure and union- Nested structures	1
21	Pointer and Structures	1
22	Array of structures	1
23	Example Program using structures and pointers	1
24	Self-referential structures	1
25	typedef	1
UNIT-V FILE PROCESSING		
26	Files Files – file input output -Types of file processing: Sequential access, Random access – Example Program: Finding average of numbers stored in sequential access file	1
27	file input output- Types of file processing	1
28	Sequential access	1
29	Random access	1
30	Example Program: Finding average of numbers stored in sequential access file	1

COURSE DESIGNERS:

1. **Dr.S.Gomathi** **gomathy@francisxavier.ac.in**
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3. **Mrs.M.Sharon Nisha** **sharonnisha@francisxavier.ac.in**

HoD/Mech

21GE1311	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

Experiments in Physics and chemistry introduced at the higher secondary levels in schools.

Objectives

1. To introduce the different experiments to test the basic understanding of physics concepts applied in optics, thermal physics and ultrasonics.
2. To make the students to acquire practical skills in handling conducting, semiconducting and ferromagnetic materials.
3. To acquire practical knowledge in properties of matter.
4. To make the students to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
5. To develop an understanding about the range and uses of analytical methods in chemistry.

S.No	List of Experiments	CO
	LIST OF EXPERIMENTS (PHYSICS)	
1	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.	CO2
2	Determination of band gap of a Semiconductor.	CO2
3	Determination of hysteresis losses in ferromagnetic material-B-H curve.	CO2
4	Determination of Wavelength, and particle size using Laser	CO1
5	Determination of Numerical aperture and acceptance angle in an optical fiber.	CO1
6	Determination of Young's modulus of the material-Non Uniform bending method	CO3
7	Determination of rigidity modulus – Torsion pendulum.	CO3
8	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	CO1
9	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer	CO1
10	Determination of wavelength of spectral lines using grating – Spectrometer.	CO1
	LIST OF EXPERIMENTS (CHEMISTRY)	
11	Determination of total, temporary & permanent hardness of water by EDTA method.	CO4
12	Corrosion experiments – weight loss method	CO5
13	Estimation of iron content of the given solution using potentiometer.	CO5
14	Conductometric titration of strong acid vs strong base	CO5
15	Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.	CO5
16	Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.	CO4

17	Determination of strength of given hydrochloric acid using pH meter.	CO5
18	Conductometric precipitation titration ($BaCl_2$ vs. Na_2SO_4).	CO5
19	Estimation of sodium and potassium present in water using flame photometer.	CO5
20	Determination of strength of acids in an acid mixture using conductivity meter.	CO5

Total Periods :60

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	**End Semester Exams (50 Marks)**
Experiments	Experiments

Outcomes

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

1. Gain knowledge on the basics of optics, thermal physics and ultrasonics.
2. Have adequate knowledge in handling conducting, semiconducting and ferromagnetic materials.
3. Apply the principles of elasticity for Engineering applications.
4.Have knowledge and will be outfitted with hands-on knowledge in the quantitative chemical analysis
of water quality related parameters.
5. Gain knowledge and will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Laboratory Requirements

(Requirements forabatchof30students)

PHYSICS LABORATORY

S.No.	**DescriptionofEquipment**	**Quantity required (R)**
1.	Diodelaser(2mWpower)orHe-Ne laser(2mW) (Lycopodiumpowder, glass plate, Grating .)	6
2.	Velocity of sound and compressibility of liquid-Ultrasonic interferometer	6
3.	Wavelength mercury spectrum – spectrometer grating	6
4.	Thermal conductivity of bad conductor Lee's Disc	6
5.	Young's modulus by non-uniform bending method. Travelling microscope, meter scale, knife edge, weights	6
6.	Careyfoster's bridge setup	6
7.	Bandgap of a semiconductors experimental setup	6
8.	Torsion pendulum setup	6
9.	B-H Curve Kit, CRO (Cathode Ray Oscilloscope)	3
10.	Fibre Optic Trainer Kit (PICO)	6

CHEMISTRY LABORATORY

S.No.	Description of Equipment	Quantity required (R)
1.	pH Meter	10
2.	Conductivity Meter	10
3.	Flame Photometer	2
4.	Potentiometer	10
5.	Spectrophotometer	2
6.	Viscometer	10
7.	Electronic Balance	1

Reference Books

1. Physics Laboratory Manual, Department of Physics, Francis Xavier Engineering College, Tirunelveli.
2. Physics Laboratory Manual, Dr. G Senthilkumar VRB Publishers Pvt. Ltd.
3. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014)

Web Recourses

1. https://lecturenotes.in/practicals/20039-lab-manual-for-engineering-physics-ep-by-engineering-kings
2. http://iul.ac.in/DWC/Syllabus/fileupload/Chemistry/_131279806192793304Chemistry-Engineering%20Chemistry%20Lab%20Manuals%20(Revised).pdf

CO Vs PO Mapping and CO Vs PSO Mapping

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

HoD/Mech

21ME1512	**ENGINEERING WORKSHOP**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Prerequisites for the course

Basic Science

Objectives

To provide exposure to the students with hands on experience on various basic engineering practices in Civil ,Mechanical, Electrical and Electronics Engineering.

S.No	**LIST OF EXPERIMENTS**	**CO**
	CARPENTRY	
1	Study of joints in roofs	CO1
2	Hands-on-practice: T joint	CO1
	WELDING	
3	Preparation of Butt joints, lap joints and T joints by shielded metal arc welding.	CO2
	SHEET METAL	
4	Forming and Bending - Model Making-Tray, Funnel, dust pan	CO2
	PLUMBING	
5	Study of pipeline joints, its locations and functions; valves, taps, couplings, unions, reducers, elbows in household fittings.	CO3
6	Hands-on-exercise: Basic pipe connections, mixed pipe material connections, pipe connections with different joining components.	CO3
	Concrete Study	
7	Study of basic construction materials, masonry and concretes	CO3
	ELECTRICAL & ELECTRONICS	
8	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	CO4
9	Fluorescent lamp wiring.-	CO4
10	Earthing Techniques	CO4
11	Stair case wiring	CO4
12	Go down Wiring	CO4
13	Study of Electronic components and equipments- Resistor Color Coding and CRO	CO5
14	Study of logic gates AND, OR, EX-OR and NOT.	CO6

15	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	CO6

Total Periods :60

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	**End Semester Exams (50 Marks)**
LAB EXERCISES-10 MARK RECORD-5 MARK VIVA-10 MARK MODEL-25	EXERCISES

Outcomes

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

C207.1-Fabricate carpentry components.
C207.2-Use welding equipment's to join the structures and sheet metal works.
C207.3-Perform basic plumbing operations and concrete study.
C207.4-Carry out basic home electrical works and appliances.
C207.5-Measure the electrical and electronic Parameters and quantities.
C207.6-Elaborate on the components, gates, soldering practices.

Laboratory Requirements

CIVIL		
1.	Assorted components for plumbing consisting of metallic pipes, Plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings	15 Sets
2.	Carpentry vice (fitted to work bench)	15 Nos.
3.	Standard woodworking tools	15 Sets
4.	Models of industrial trusses, door joints, furniture joints	5 Nos.
5.	Power Tools: Demolition Hammer Hand Drilling Machine Wooden Cutter	 2 Nos. 2 Nos. 2 Nos.
MECHANICAL		
1.	Arc welding transformer with cables and holders	5 Nos.
2.	Welding booth with exhaust facility	5 Nos.
3.	Welding accessories like welding shield, chipping hammer, Wire brush, etc.,	5 Sets
4.	Power Tool: Angle Grinder	2 Nos.
5.	Sheet metal working tools	15 Sets.
6.	Standard working tools	15 sets
ELECTRICAL		
1	Assorted electrical components for house wiring	15 Sets
2	Electrical Measuring Instruments	10 Sets
3	Study purpose items: Iron box, fan and regulator, emergency lamp	1 Each
4	Megger(250V/500V)	1No.
5	Power Tools: (a) Range Finder (b) Digital Live-wire detector	2 Nos

ELECTRONICS

Soldering guns	10 Nos.
Assorted electronic components for making circuits	50Nos.
Small PCBs	10 Nos.
Multimeters	10Nos.

Reference Books

1. K.Jeyachandran, S.Natarajan& S, Balasubramanian, "A Primer on Engineering Practices Laboratory", Anuradha Publications, (2007)
2. T.Jeyapoovan, M.Saravanapandian&S.Pranitha, "Engineering Practices Lab Manual", Vikas Publishing House Pvt. Ltd, (2006)
3. H.S. Bawa, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, (2007)
4. A.Rajendra Prasad & P.M.M.S. Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P.Kannaiah&K.L.Narayana, "Manual on Workshop Practice", Scitech Publications, (1999)

Web Recourses

https://nptel.ac.in/courses/112107250/ - Sheet metal works

Co/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	PSO_3
CO1	2		1										1		
CO2	2		1										1		
CO3	2		1										1		
CO4	2		1										1		
CO5	2		1										1		

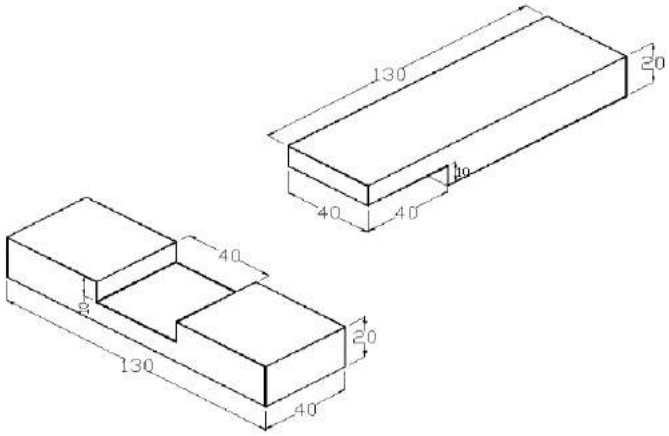
BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Conduct of experiments	Record	Viva	Model	END SEM EXAM
REMEMBER					
UNDETSTSND					
APPLY					
ANALYZE	10	5	10	25	50
EVALUATE					
CREATE					

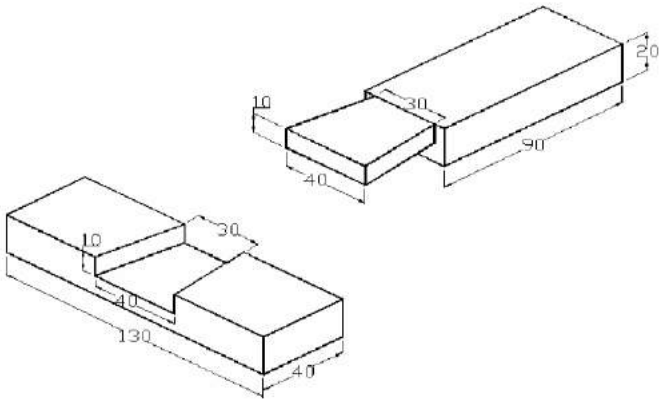
COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Fabricate carpentry components (Apply)

1. Make a T-lap joint from the given wood pieces as shown in thedrawing.

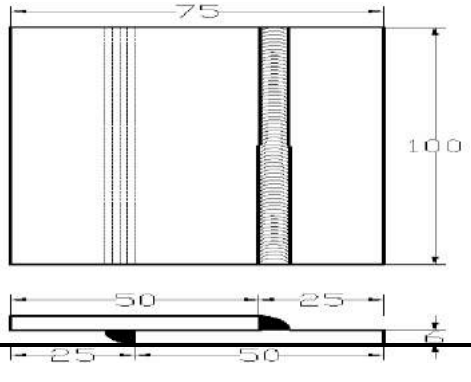


2.Make a dovetail joint from the given wooden work piece as per the drawing givenbelow.

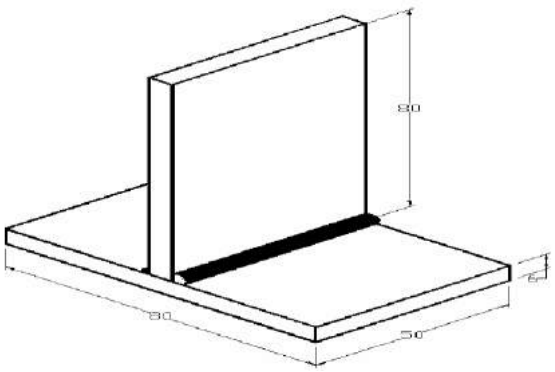


COURSE OUTCOME 2: Students will be able to Use welding equipment's to join the structures and sheet metal works (Apply)

1. Make a Lap joint from the given pieces using arc welding as shown in the drawing.

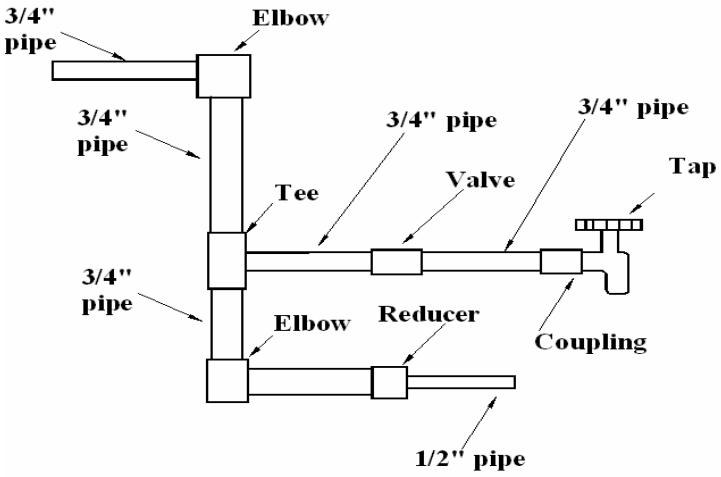


2.Prepare a 'T' joint from the given M.S. plates using arc welding as shown in thediagram

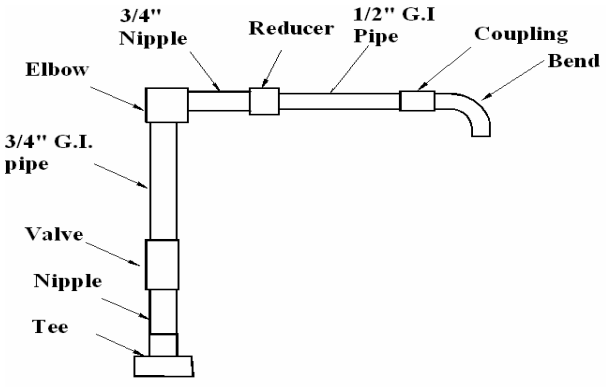


COURSE OUTCOME 3: Students will be able to Perform basic plumbing operations

1.Make a pipe fitting connections from the given GI / PVC pipes and fittings as shownin the drawing.



2.Prepare the GI / PVC Pipe joint by using the given pipes and fittings as per thediagram givenbelow.



COURSE OUTCOME 4: Students will be able to Carry out basic home electrical works and appliances.

1. Make an industrial illumination circuit wiring using switches, fuse, indicator, lamp and energy meter.

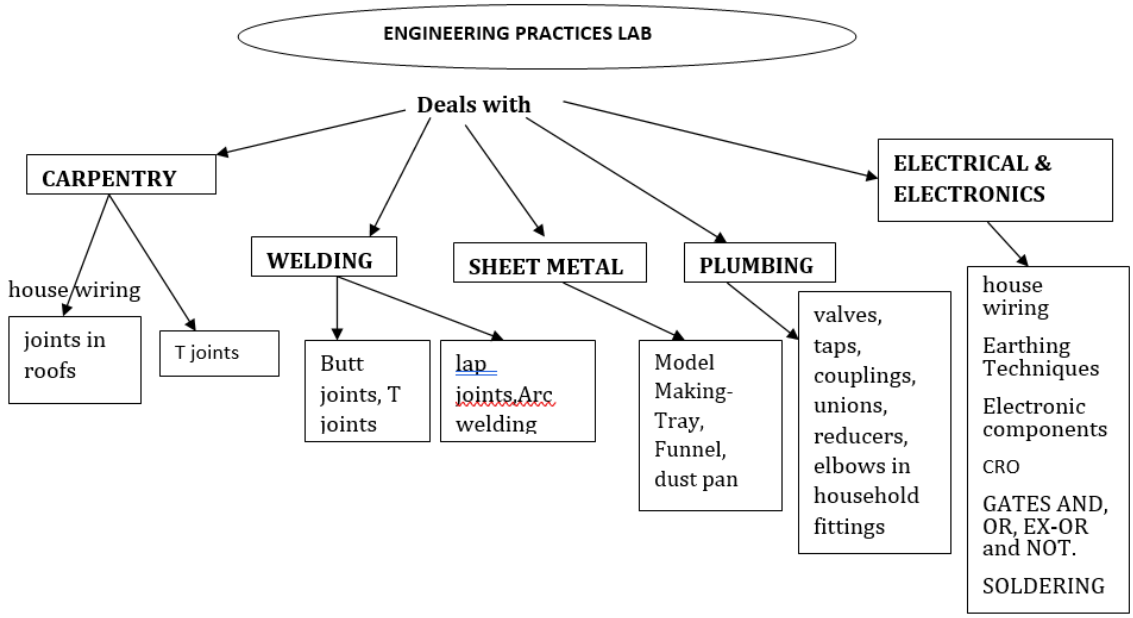
COURSE OUTCOME 5: Students will be able to measure the electrical and electronic Parameters and quantities

1. Conduct an experiment using a starter to show the lamp will continue to glow even when starter is removed.

COURSE OUTCOME 6: Students will be able to elaborate on the components, gates, soldering practices

1. To perform soldering and Desoldering of electronic components on PCB

CONCEPT MAP



COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	CARPENTRY	
1	Study of joints in roofs	**1**
2	Hands-on-practice: T joint	**1**
	WELDING	
3	Preparation of Butt joints, lap joints and T joints by shielded metal arc welding.	**2**

SHEET METAL		
4	Forming and Bending - Model Making-Tray, Funnel, dust pan	**2**
PLUMBING		
5	Study of pipeline joints, its locations and functions; valves, taps, couplings, unions, reducers, elbows in household fittings.	**2**
6	Hands-on-exercise: Basic pipe connections, mixed pipe material connections, pipe connections with different joining components.	**2**
Concrete Study		
7	Study of basic construction materials, masonry and concretes	**1**
ELECTRICAL & ELECTRONICS		
8	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	**1**
9	Fluorescent lamp wiring.-	**1**
10	Earthing Techniques	**1**
11	Stair case wiring	**1**
12	Go down Wiring	**1**
13	Study of Electronic components and equipments- Resistor Color Coding and CRO	**1**
14	Study of logic gates AND, OR, EX-OR and NOT.	**1**
15	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	**1**

COURSE DESIGNERS:

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2.K.ROBINSTONJEYASINGH **robinstonjeyasingh@francisxavier.ac.in**

HoD/Mech

Semester II

21 GE2101	ENGLISH FOR TECHNICAL COMMUNICATION	L	T	P	C
		2	0	0	2

Prerequisites for the course

- The prerequisite knowledge required to study this Course is the basic knowledge in English Language.

Objectives

1. To widen strategies and skills to augment ability to read and comprehend engineering and technology texts.
2. To draft convincing job applications and effective reports.
3. To develop speaking skills to make technical presentations, participate in group discussions.
4. To strengthen listening skills to comprehend technical lectures and talks in their areas of specialization.
5. To cultivate writing skills both technical and general.

MODULE 1	READING AND STUDY SKILLS	6

Reading - Reading longer technical texts and taking down notes – Note Making strategies ;**Writing-** interpreting charts (all the types), graphs – comparing and contrasting statements/paragraphs – analysing technical details; **Vocabulary Development** - Select Technical Vocabulary; **Language Development** - Active Voice and Passive Voice

Suggested Activities	Evaluation Method
i) Visit to the Library - Reading articles on emerging trends and taking down notes in the prescribed format - Submission through FAST FORMS - Minimum 2	i) Content & Structure
ii) Writing compare and contrast statements. (Eg. Windows 10 Vs Windows 1, RPA Developer Vs RPA Analyst, Edge Computing Vs Quantum Computing) and the like related to the programme.	**ii)** Submission: Fast form Document Submitted document will be assessed for a) Communication Etiquette b) Language Style c) Sentence Construction
iii) Teaching of Grammar Contents	**Activity iii** will be assessed through google form tests/ written tests.

MODULE 2	INTRODUCTION TO PROFESSIONAL WRITING	6

Reading - Technical related topics; **Writing** - purpose statements – extended definitions - writing instructions – checklists – recommendations – Minutes of the Meeting ; **Vocabulary Development** - select Technical Vocabulary ; **Language Development** - Subject Verb Agreement, Compound Words.

Suggested Activities	**Evaluation Method**
i) Visit to the Library - Reading articles on emerging trends and writing down purpose statements and extended definitions. Submission through FAST FORMS - Minimum 2	**i) Content & Structure**
ii) Writing a set of 8 Instructions, Recommendations and Checklists for the suggested topics. (each 2 sets)	**ii)** Submission: Fast form Document Submitted document will be assessed for a) Communication Etiquette b) Language Style c) Sentence Construction
iii) Teaching of Grammar Contents	**Activity iii** will be assessed through google form tests/ written tests.

MODULE 3	**INTERVIEW SKILLS**	**6**

Listening - Listening to mock Interviews ;**Speaking** - answering Interview questions – GD Strategies; **Reading**- longer texts both general and technical, practice in speed reading ; **Writing** - Job Application - Resume; Writing opinion paragraph - Writing paragraphs with reasons; **Language Development** - If – Conditionals

Suggested Activities	**Evaluation Method**
i) Listening to **UPSC Toppers Mock Interviews**.	i) Answering questions for Interview questions(Android app based) Responses will be assessed for a) Fluency b) Communication etiquette c) Language style
ii) Drafting Job application and Resume building.	**ii)** Submission: Fast form Document Submitted document will be assessed for a) Language Style b) Design
iii) Teaching of Grammar Contents	**Activity iii** will be assessed through google form tests/ written tests.

MODULE 4	**REPORT WRITING - I**	**6**

Writing - Fire accident Report, Industrial Visit Report, Project Report; **Vocabulary Development**- finding suitable synonyms - paraphrasing ;**Language Development** - Clauses.		
Suggested Activities i) Drafting reviews and reports on Industries - a) Profile & Products b) Trending technology adopted c) Careers d) Latest news Min - 2 Industries ii) Teaching of Grammar Contents	**Evaluation Method** i) Content & Structure **Activity ii** will be assessed through google form tests/ written tests.	
MODULE 5	**REPORT WRITING II**	**6**
Writing - Writing Feasibility Reports, Survey Reports ;**Vocabulary Development** - verbal analogies ; **Language Development** - advanced use of Articles, Prepositional Phrases.		
Suggested Activities i) Drafting feasibility report on- a) Launching a new product / Technology Min - 2 ii) Teaching of Grammar Contents	**Evaluation Method** i) Content & Structure **Activity ii** will be assessed through google form tests/ written tests.	
	Total Periods	**30**

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
(i) Google Form based - on-lineTest (ii) Written Test	(i) Google Form based - on-lineTest incorporating Listening, Speaking and Reading	Written Test

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

CO1: Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more.

CO2: Review technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.

CO3: Articulate appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world.

CO.4: Write reports utilizing the required format prescribed on par with international standards using the exact vocabulary to make their reports worthy to be read.

CO.5: Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.

Text Books

1. Mike Markrl. Technical Communication,Palgrave Macmillan: London, 2012.
2. Sumant,S and Joyce Pereira. Technical English II. Chennai: Vijay Nicole Imprints Private Limited, 2014.
3. Kumar, Sanjay and Pushp Lata. Communication Skills: A Workbook. New Delhi: OUP, 2018.

Reference Books

1. Raman, Meenakshi & Sangeetha Sharma. Communication Skills. New Delhi: OUP, 2018
2. Rizvi M, Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007

Web Resources

1. Interpretation of Charts :https://youtu.be/4lxA7lo9GLU : https://www.englishhints.com/charts-and-graphs.html
2. Instructions https://www.wikihow.com/Write-Clear-Instructions
3. Resume building https://novoresume.com/career-blog/how-to-write-a-resume-guide
4. Report writing - https://www.youtube.com/watch?v=FXIuHOFAxos ; https://www.deakin.edu.au/students/studying/study-support/academic-skills/report-writing

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1				2			3		1	3	2	3			
2				2			2		3	3	2	2			
3				1			1		3	3	2	2			
4				3			2		2	3	3	2			
5				2			2		3	3	2	2			

Assessment Pattern

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT - 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	30	10	10	30
APPLY	60	60	10	10	60
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) :Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more.

1) Read the given passage and take notes.
2) Analyse the given type of chart or graph and answer the questions given.
3) Analyse the given chart or graph and write paragraphs comparing and contrasting the data.
4) Analyse the given chart or graph and write paragraphs giving importance to technical details.
5) Fill in the blank with appropriate technical vocabulary.
6) Convert the given active voice sentence into passive voice or impersonal passive voice.

COURSE OUTCOME 2 (CO 2) :Review technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.

1) Write a purpose statement for the tool or gadget given.
2) Write an extended definition for the given word.
3) Write 8 instructions / recommendations on the given topic.
4) Write the Minutes of the meeting for the given meeting.
5) Fill in the blank with appropriate Subject Verb agreement.
6) Fill in the blank with suitable compound words.

COURSE OUTCOME 3 (CO 3) :Articulate appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world.

1) Listening to mock interviews and answering the questions.
2) Listen to the strategies of GD and answer the given questions.
3) Read and submit a recording of technical content following the strategies of speed reading.
4) Write Job application with a cover letter for the given job description.
5) Write paragraphs expressing opinion on the given topic.
6) Fill in the blank / complete the sentence with appropriate If-Conditionals.

COURSE OUTCOME 4 (CO 4) :Write reports utilizing the required format prescribed on par with international standards using the exact vocabulary to make their reports worthy to be read.

1) Write a fire accident report for the provided incident.
2) Write an Industrial visit report.

3) Write a report on the Project work undertaken by the candidate giving importance to the current status report and the time needed for the completion of the project.
4) Find the appropriate synonym for the given word.
5) Paraphrase the given passage.
6) Fill in the blank with appropriate clauses.

COURSE OUTCOME 5 (CO 5) :Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.

1) Write a Feasibility report for a business / project proposal given.
2) Write a survey report for the given scenerio.
3) Pick out the appropriate Verbal Analogy.
4) Fill in the blank with appropriate articles.
5) Complete the sentence with appropriate Prepositional Phrases.
6) Choose the appropriate word to complete the sentence.

Concept Map

TECHNICAL COMMUNICATION

LISTENING

- Listening to mock Interviews.

SPEAKING

- Answering Interview questions.
- Participating in GD

READING

- Reading articles on emerging trends and taking notes.
- Technical topics.
- Longer texts both general and technical and practice speed reading.

WRITING

- Interoperation of charts and Graphs.
- Purpose Statements
- Extended Definitions
- Writing Instructions
- Checklists
- Recommendations
- Minutes of the Meeting
- Job Application & Resume
- Writing opinion paragraph
- Fire accident Report
- Industrial Visit Report
- Project Report
- Writing Feasibility Reports
- Survey Reports

LANGUAGE DEVELOPMENT

- Active Voice and Passive voice
- If – Conditionals
- Clauses
- Advanced use of Articles
- Prepositional Phrases.

VOCABULARY DEVELOPMENT

- Technical Vocabulary
- Subject Verb Agreement
- Compound Words
- Synonyms
- Paraphrasing
- Verbal Analogies

Course Content and Lecture Schedule

S. No	Topic	No of Hours required
	UNIT - I (6 Hrs)	
1	Note Making strategies.	1
2	Note Making strategies - Reading longer technical texts and taking down notes.	1
3	Interpreting charts - types - comparing and contrasting.	1
4	Interpreting charts - write statements/paragraphs – analysing technical details.	1
5	Select Technical Vocabulary	1
6	Active Voice and Passive Voice	1
	UNIT - II (6 Hrs)	
7	Reading Technical Topics	1
8	Purpose Statements – Extended Definitions	1
9	Checklists / Instructions	1
10	Recommendations	1
11	Minutes of the Meeting	1
12	Subject Verb Agreement, Compound Words.	1
	UNIT - III (6 Hrs)	
13	Listening to mock Interviews.	1
14	Answering interview questions	1
15	Reading longer texts both general and technical, practice in speed reading	1
16	Job Application and Resume	1
17	Writing opinion paragraph	1
18	If – Conditionals	1
	UNIT - IV (6 Hrs)	
19	Fire accident Report	1
20	Industrial Visit Report	1
21	Project Report	1
22	Finding Suitable Synonyms	1
23	Paraphrasing	1
24	Clauses.	1
	UNIT - V (6 Hrs)	
25	Feasibility Reports	1
26	Survey Reports	1
27	Reviewing Reports	1
28	Verbal Analogies	1
29	Advanced use of Articles	1
30	Prepositional Phrases	1

HoD/Mech

21GE2201	PARTIAL DIFFERENTIAL EQUATION AND APPLICATION OF FOURIER SERIES	L	T	P	C
		3	1	0	4

Prerequisites for the course

Basic knowledge of Differentiation and Integration.

Objectives

1. To expose to the concept of Analytical function
2. To familiarize with Complex integration
3. To introduce Fourier series analysis which is central to many applications in engineering apartfrom its use in solving boundary value problems
4. To acquaint the student with PDE and Fourier series techniques in solving heat flow problems used in various situations.
5. To improve the knowledge of Laplace transform.

UNIT I	ANALYTIC FUNCTIONS	9

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method and bilinear transformation.

UNIT II	COMPLEX INTEGRATION	9

Cauchy's integral theorem (without proof) – Cauchy's integral formulae and its applications – Taylors and Laurent's series-Singularities – Poles and Residues – Cauchy's residue theorem.

UNIT III	FOURIER SERIES	9

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

UNIT IV	PDE AND APPLICATIONS OF FOURIER SERIES	9

Formation of PDE – Homogenous linear PDE -Method of separation of variables - Fourier Series Solutions of one-dimensional wave equation – One dimensional equation of heat conduction**.**

UNIT V	LAPLACE TRANSFORMS	9

Transforms of simple functions – Basic operational properties — Inverse transforms – Convolution theorem – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1.Description Questions 2.Formative Multiple Choice Questions	1.Assignment 2.Online Quizzes 3.Problem –Solving Activities	1.Description Questions 2.Formative Multiple Choice Questions

Outcomes

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

CO1: Construct an analytic function ,when its real or Imaginary part is known. Find the bilinear transformations**.**

CO2: Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.

CO3: Find singularities of complex functions and determine the values of integrals using residues.

CO4: Construct the Fourier series expansion of the periodic function.

CO5: Explain the methodology of solving a Partial differential equation. Solve the problems of one-dimensional wave and heat equation.

CO6: Apply Laplace Transform technique to solve the given ordinary differential equation.
Text Books
1. B. S. Grewal, " Higher Engineering Mathematics", 45rd edition, 2017.
Reference Books
1. A Textbook of Engineering Mathematics(Dr. A.P.J. Abdul Kalam Technical University, Lucknow) (For . Gautam Bhudh technical Universities ,Lucknow) January 2020 2. Kreyszig.E, "*Advanced Engineering Mathematics*", John Wiley & Sons. Singapore, 15th edition, 2017.
Web Recourses
1. https://easyengineering.net/ma8251-engineering-mathematics-ii/

MAPPING WITH PROGRAM OUTCOMES:

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

ASSESSMENT PATTERN :

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT - 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	30	10	10	30
APPLY	60	60	10	10	60
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) :

1) Construct an analytic function whose imaginary part is $v = e^x(x\cos y - y\sin y)$.
2) Find the bilinear transformation that maps the points Z =0, -1 ,i on to the points $i, 0, \infty$.

COURSE OUTCOME 2 (CO 2) :

1) What is the necessary condition for a function is analytic?
2) Show that $e^x \cos y$ is harmonic.

COURSE OUTCOME 3 (CO 3) :

1)Evaluate $\int \frac{e^{2z}}{(z+1)^4} dz$ using Cauchy's Integral formula where C is $|z| = 2$.

2) Evaluate $\int \frac{2z-1}{z(z+1)(z-3)} dz$ using Cauchy's Residue theorem where C is $|z| = 2$.

COURSE OUTCOME 4 (CO 4) :

1) Construct Fourier series for $f(x) = x$ in $(-\pi, \pi)$.
2) Construct Fourier series for $f(x) = x^2$ in $(-l, l)$.

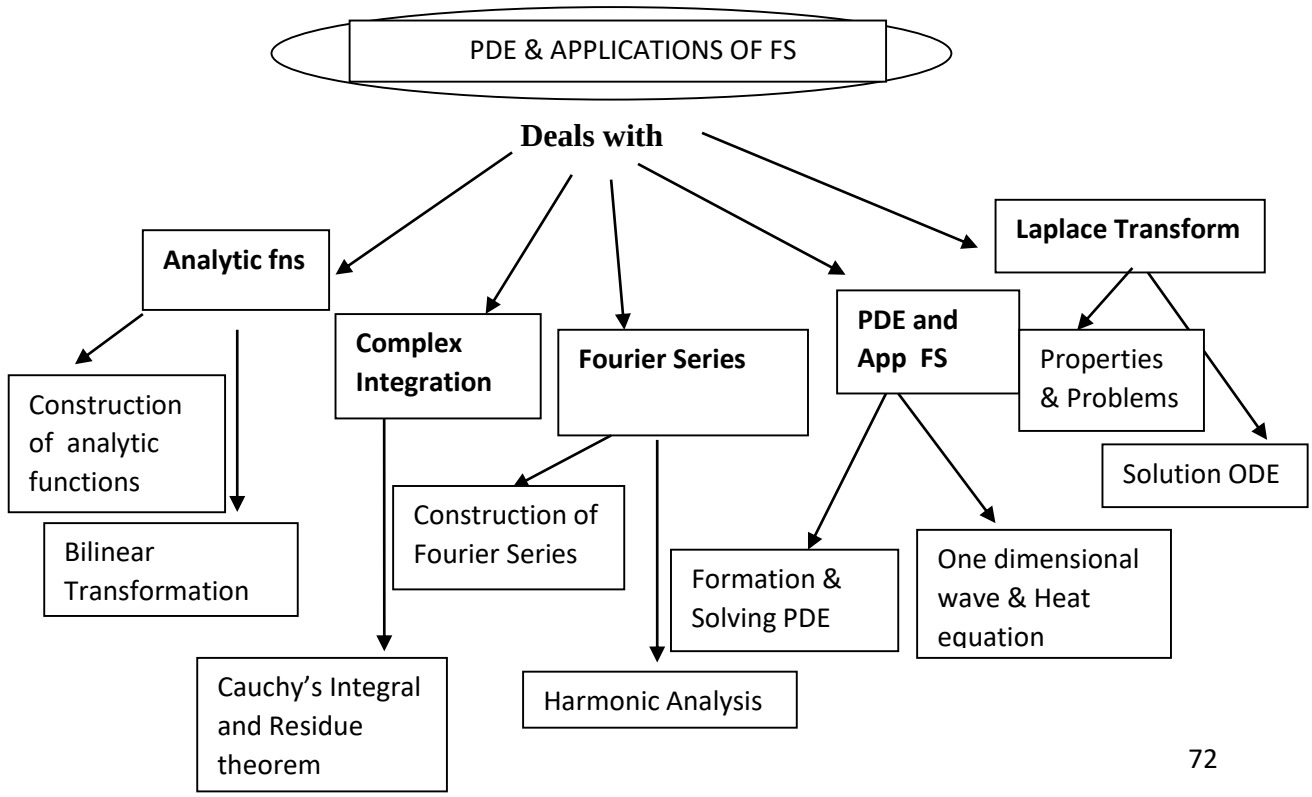
COURSE OUTCOME 5 (CO 5) :

1) Solve $(D^2 - 3DD' + 2D'^2)z = e^{2x+y} + 4$.
2) A tightly stretched string with fixed end points $x = 0, x = l$ is initially at rest in its equilibrium position. If it is vibrating, giving each point a velocity $\lambda x(l - x)$. Find the displacement of the string at any time 't'.

COURSE OUTCOME 6 (CO 6) :

1) Solve $\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2$, given $x = 0$ and $\frac{dx}{dt} = 5$ for $t = 0$ using Laplace transform method.
2) Find the Laplace transform for $\frac{\cos at - \cos bt}{t}$.

CONCEPT MAP:



COURSE CONTENTS AND LECTURE SCHEDULE

S. No	TOPIC	NO.OF LECTURES
I	**ANALYTIC FUNCTIONS**	
1	Introduction – Definition and CR Equations	1
2	Properties of Analytic Functions	1
3	Problems Under the Properties	1
4	Tutorial	1
5	Determination of Harmonic conjugate	1
6	Milne Thomson Method – Construction of Analytic function	3
7	Tutorial	1
8	Bilinear Transformation	2
9	Tutorial	1
II	**COMPLEX INTEGRATION**	
10	Introduction	1
11	Cauchy's Integral Formula	1
12	Cauchy's Integral Formula for Higher derivatives	1
13	Tutorial	1
14	Taylor's series	1
15	Laurent's series	1
16	Types of Singularities	1
17	Tutorial	1
18	Poles and Residues	1
19	Cauchy's Residue Theorem	1
20	Problems under Cauchy's Residue theorem	1
21	Tutorial	1
III	**FOURIER SERIES**	
22	Introduction – Dirichlet Conditions	1
23	Fourier Series in (0, 2l)	1
24	Fourier Series in (0, 2π)	1
25	Tutorial	1
26	Odd and Even Functions	1
27	Fourier Series in (-π, π)	1
28	Fourier Series in (-l, l)	1
29	Tutorial	1
30	Half Range Sine and Cosine Series	2
31	Problems under Parseval's Identity	1
32	Harmonic Analysis	1
IV	**PDE AND APPLICATIONS OF FOURIER SERIES**	
33	Introduction	1
34	Formation of PDE	1
35	Homogeneous Linear PDE	3
36	Tutorial	1
37	Method of separation of variables	1

38	One dimensional wave equation – Initial Position Given Problems	2
39	Initial Velocity given Problems	1
40	Tutorial	1
41	One dimensional Heat Equation	1
V	**LAPLACE TRANSFORM**	
42	Introduction	1
43	Properties of Laplace Transform	1
44	Problems Under Properties	1
45	Tutorial	1
46	Problems Using the Formula	2
47	Inverse Laplace Transform – Properties	1
48	Problems Under Properties	1
49	Tutorial	1
50	Convolution Theorem	1
51	Solving ODE using Laplace Transform	2
	TOTAL HOURS	**45 + 15**

HoD/Mech

21ME2501	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

Prerequisites for the course

HSC Mathematics and Engineering Physics

Objectives

To develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering

UNIT I	STATICS OF PARTICLES	9

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces – additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility

UNIT II	EQUILIBRIUM OF RIGID BODIES	9

Free body diagram – Types of supports – Action and reaction forces – stable equilibrium –Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force – equilibrium of Rigid bodies in two dimensions

UNIT III	PROPERTIES OF SURFACES AND SOLIDS	9

Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section, – Angle section, Hollow section by using standard formula – Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia

UNIT IV	DYNAMICS OF PARTICLES	9

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's laws of motion – Work Energy Equation – Impulse and Momentum – Impact of elastic bodies

UNIT V	FRICTION	9

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
CAT – I CAT - II	Assignment, Multiple Choice Questions	Multiple Choice Questions

Outcomes

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

CO1: Enumerate the basic laws of mechanics and practice the vector manipulation, equilibrium conditions on the systems of forces acting on particles.

CO2: Compute reaction force and moment on the rigid bodies using both vector and scalar methods

CO3: Determine the center of gravity and moment of inertia of the standard and composite section

CO4: Adapt equation of motion, principles of D'Alembertz work energy and impulsemomentum to the problems on dynamics of particles.

CO5: Describe frictional laws to compute the frictional forces for bodies in contact.

CO6: Create a computer program using programming languages for the problems on engineering mechanics

Text Books

1. Beer, Johnston, Mazurek, Cornwells and Sanghi, "Vector Mechanics for Engineers: Statics, Dynamics", 10th Edition, Tata McGraw Hill Noida, Uttar Pradesh, (2019)
2. N.H. Dubey, "Engineering Mechanics Statics and Dynamics", 1st Edition, McGraw-Hill Education India Private Ltd., New Delhi, (2017)

Reference Books

1. R.C. Hibbeler, "Engineering Mechanics: Dynamics", 13 th Edition, Prentice Hall, (2013)
2. J.L. Meriam and L.G. Kraige, "Engineering Mechanics: Dynamics", 7th Edition, Wiley India Private Limited, (2016)
3. Irving H. Shames, "Engineering Mechanics Statics and Dynamics", 4th Edition, Pearson India, (2011)

Web Recourses

1. https://nptel.ac.in/courses/122/104/122104015/
2. https://nptel.ac.in/courses/112/103/112103109/

CO Vs PO Mapping and CO Vs PSO Mapping

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

5	3	3	2										3		
6	3	2	1										3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	20			
UNDERSTAND	40	40	5		
APPLY	40	40	10	10	
ANALYZE			10	10	
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Enumerate the basic laws of mechanics and practice the vector manipulation, equilibrium conditions on the systems of forces acting on particles. (Remember, Understand)

1. Determine the magnitude and direction of the resultant of two forces 100 N and 150 N acting at angle of 45◦

2. If the two tensions in the pulley cable shown in Fig. 2.39 are 400 N, determine the resultant R exerted on the pulley by the two tensions.

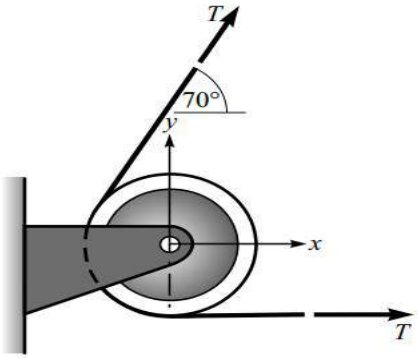
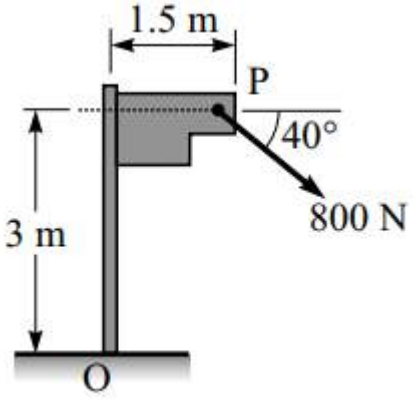


Fig. 2.39

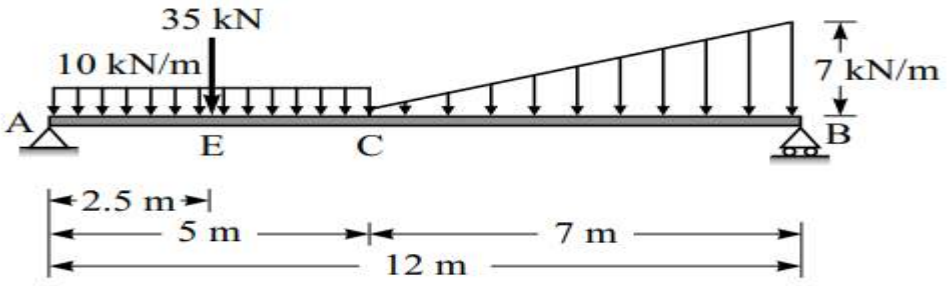
COURSE OUTCOME 2: Compute reaction force and moment on the rigid bodies using both vector and scalar methods (Understand, Apply)

2. An 800-N force is applied to a 3-m high pole at the point P, as shown in Fig. 3.9a. Calculate the magnitude of moment of this force about the base point O by four different methods.



(*a*)

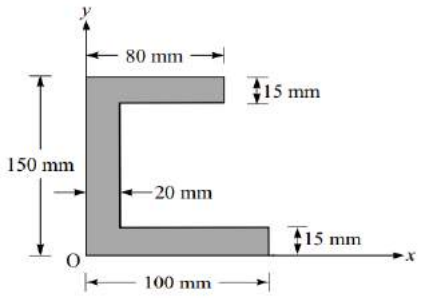
2. Calculate the support reactions for a simply supported beam with hinged support at the end A and roller support at the end B, subjected to inclined loading as shown in Fig 5.15a.



(*a*) Cantilever

COURSE OUTCOME 3: Determine the center of gravity and moment of inertia of the standard and composite section (Understand,Apply)

1. Find the centroid of the plane lamina shown in Fig. 9.22a.



(*a*) Channel section

2. A flywheel (Fig. 10.26) consists of a rim of 2500-kg mass and four spokes each of 60-kg mass. The rim has inner and outer radii of 1.1 m and 1.5 m, respectively. The shaft at the center of the wheel has a diameter of 0.25 m and a mass of 1200 kg. Determine (a) the moment of inertia of flywheel about its axis of rotation, and (b) its radius of gyration.

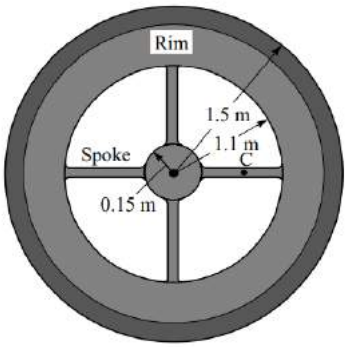


Fig. 10.26

COURSE OUTCOME 4: Adapt equation of motion, principles of D'Alembertz, work energy and impulsemomentum to the problems on dynamics of particles. (Understand,Apply)

2. In Asian games, for 100 m event an athlete accelerates uniformly from the start to this maximum velocity in a distance of 4 m and runs the remaining distance with that velocity. If the athlete finishes the race in 10.4 seconds, determine (i) his initial acceleration (ii) his maximum velocity

3. Three spherical balls A, B and C of 3kg, 9kg and 18 kg masses are moving in the same direction with velocities of 12 m/s, 4 m/s and 2 m/s, respectively, as shown in Fig. 17.16. If the ball A Collides with the ball B which in turn collides with the ball C, prove that the balls A and B come to rest after the impacts. Assume that all the impacts are perfectly elastic.

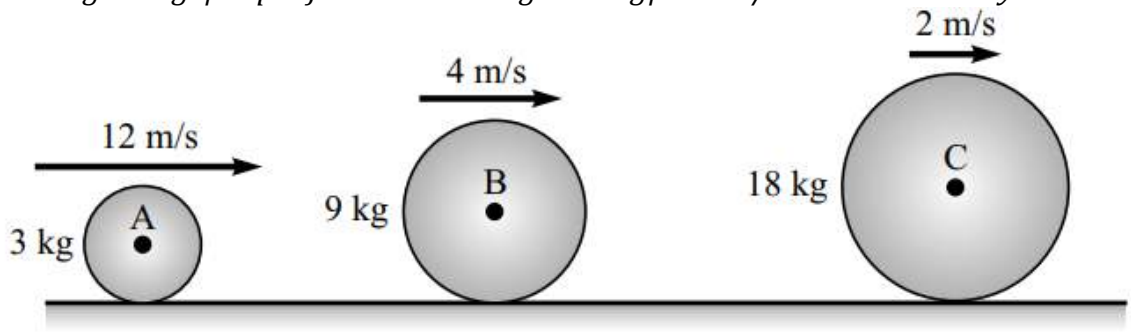
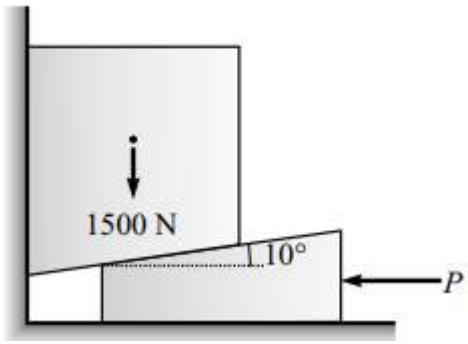


Fig. 17.16

COURSE OUTCOME 5: Describe frictional laws to compute the frictional forces for bodies in contact. **(Understand,Apply)**

1. A 1500-N block overlaying a 10-degree wedge on a horizontal floor and leaning against a vertical wall, is to be raised by applying a horizontal force P as shown in Fig. 7.9a. Determine the force P necessary to just start the motion, if the coefficient of friction is 0.3



(*a*) Wedge pushed by *P*

2. A uniform ladder of 5-m length and 20-N weight is placed against a smooth vertical wall with its lower end 4 m away from the wall. If the ladder is just to slip, determine the coefficient of friction between the ladder and floor, and the frictional force acting on the ladder at the point of contact with the floor.

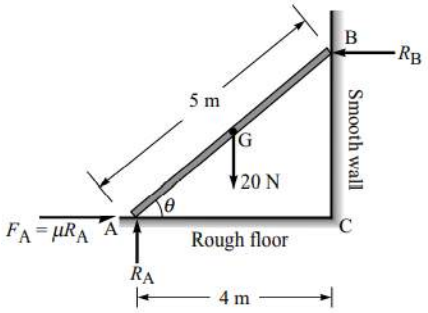
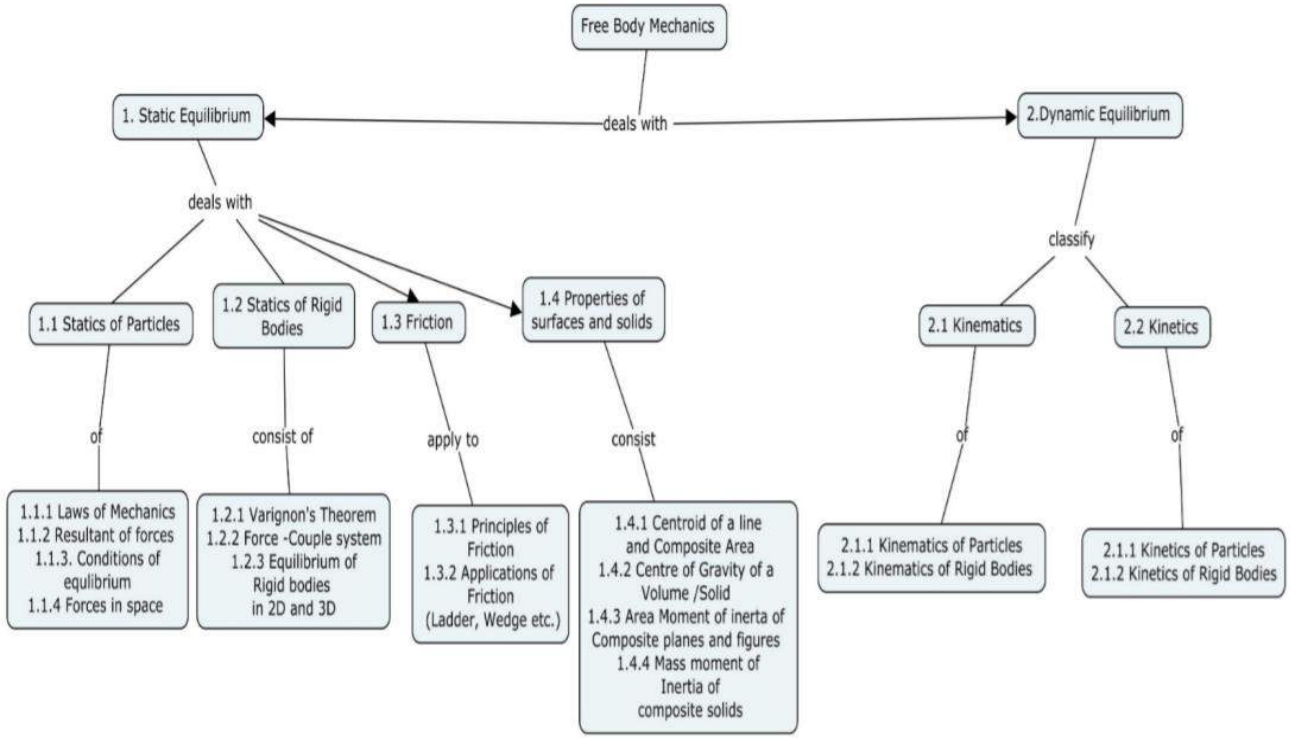


Fig. 7.13

CONCEPT MAP



COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - STATICS OF PARTICLES		
1	Introduction – Units and Dimensions ––	1
2	Laws of Mechanics – Lami's theorem	1
3	Parallelogram and triangular Law of forces	1
4	Vectorial representation of forces – Vector operations of forces – additions, subtraction, dot product, cross product	1
5	Equilibrium of a particle	1
6	Forces in space	1
7	Equilibrium of a particle in space – Equivalent systems of forces	1
8	Coplanar Forces – rectangular components–	1
9	Principle of transmissibility	1
UNIT II- EQUILIBRIUM OF RIGID BODIES		
10	Free body diagram -Moments and Couples	1
11	Types of supports - Action and reaction forces	1
12	stable equilibrium	1
13	Moment of a force about a point and about an axis	1
14	Vectorial representation of moments and couples	1
15	Scalar components of a moment	1
16	Varignon's theorem	1
17	Single equivalent force	1
18	Equilibrium of Rigid bodies in two dimensions	1
UNIT III- PROPERTIES OF SURFACES AND SOLIDS		
19	Centroids and centre of mass	1
20	Centroids of lines and areas	1
21	Rectangular, circular, triangular areas by	1

	integration	
22	T section, I section, – Angle section, Hollow section by using standard formula	1
23	Theorems of Pappus	1
24	Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration	1
25	Parallel axis theorem and perpendicular axis theorem	1
26	Principal moments of inertia of plane areas	1
27	Principal axes of inertia-Mass moment of inertia	1
UNIT IV- DYNAMICS OF PARTICLES		
28	Displacements, Velocity and acceleration, their relationship	2
29	Relative motion	2
30	Curvilinear motion	1
31	Newton's laws of motion	1
32	Work Energy Equation	1
33	Impulse and Momentum	1
34	Impact of elastic bodies	1
UNIT V- FRICTION		
36	Friction force	2
37	Laws of sliding friction	2
38	equilibrium analysis of simple systems with sliding friction	3
39	wedge friction	2

COURSE DESIGNERS:

1. **M.SARAVANA KUMAR** **saravanakumar@francisxavier.ac.in**
2. **M.Ayyanar Raja** **ayyanarraja@francisxavier.ac.in**

HoD/Mech

21GE2501	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS SCIENCE	L	T	P	C
		3	0	0	3

Prerequisites for the course

Basic Science

Objectives

To impart knowledge on

1. DC and AC circuits using basic laws.
2. Construction, working principle, EMF equation of DC machines, single phase transformer, alternator, synchronous motor and induction motor.
3. Construction, operation, characteristics and applications of semiconductor devices.
4. Application circuits of Electronics Devices
5. Concepts of logic gates and their applications.

UNIT I	ELECTRIC CIRCUITS	9

Ohms law, Kirchhoff‟s Laws, Reduction of series and parallel circuits solving simple DC Circuits-single phase AC circuit fundamentals-Power, Power factor-solving simple AC circuits- Introduction to three phase AC circuits

UNIT II	ELECTRICAL MACHINES	9

DC MACHINE: Principle of Operation DC Motor-types-torque equation - speed-torque characteristics-losses and efficiency- speed control of DC motors-Electric Braking

AC MACHINES: Single phase Transformers - Construction and working principle, 3 phase Induction Motor-construction–Principle of operation- types-torque equation-speed -torque characteristics-1 phase Induction Motor-Principle of operation-types – Industrial Applications.

UNIT III	**ELECTRONIC DEVICES**	**9**

Operation of PN junction diodes, VI characteristics, zener diode, BJT, types-CB, CE, CC configurations, input and output characteristics, JFET - working principle and characteristics - Comparison of BJT and FET. MOSFET-types, principle of operation and characteristics, Opto Electronic Devices - Principles and Applications.

UNIT IV	**ELECTRONIC CIRCUITS : (Qualitative analysis only)**	**9**

Half wave and full wave rectifier, capacitive filters, zener voltage regulator, RC- coupled amplifier, frequency response, RC phase shift oscillator. Linear Integrated Circuits: Operational amplifiers, Ideal op-amp characteristics, Inverting and Non-inverting amplifier, op-amp applications - Adder- Subtractor, integrator, differentiator, comparator, zero crossing detector.

UNIT V	**DIGITAL ELECTRONICS**	**9**

Number systems-representation of signed numbers: 1"s complement and 2"s complement, logic gates, Half adder, full adder, Flip flops, RS,JK,JK Master slave, D and T type, counters and shift registers.

	Total Periods	**45**

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
CAT – 1 CAT - II	FAT 1 (MCQ's), (Open book Test) FAT 2	MCQ's

Outcomes

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

CO1: Analyze DC and AC circuits using basic laws.
CO2: Explain about DC &AC machines and identify their applications.
CO3: Analyze and compare the construction, theory and characteristics of the semiconductor devices.
CO4: Design the application circuits of Electronic devices
CO5: Design basic combinational and sequential logic circuits.

Text Books

1. Muthusubramanian R, Salivahanan S, "Basic Electrical and Electronics Engineering", Mc Graw Hill, New Delhi, 2009.

Reference Books

1. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford University press, 2012.
2. V K Mehta, Rohit mehta "Principles of Electronics", S.Chand& Company Ltd, 2015.
3. Mahmood Nahvi & Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, Mc Graw Hill, 5th Edition,2009.

Web Resources: Nil

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
1	3	3	3	3								2	2		2
2	3	3	3	3								2	3		2
3	3	3	3	3								2	3	1	2
4	3	3	3	3	2	1						2	3	1	3
5	3	3	3	3	2	1						2	3		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	20			20
UNDETSTSND	30	30	10		30
APPLY	20	20	5	5	20
ANALYZE	15	15	10	10	15
EVALUATE	15	15		10	15
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. The resistivity of the conductor depends on _____
2. The resistance of a conductor of diameter d and length l is R Ω. If the diameter of the conductor is halved and its length is doubled, the resistance will be _____

COURSE OUTCOME 2:

1.If field current is decreased in shunt dc motor, the speed of the motor _____
2. What is the shunt resistance component equivalent circuit obtained by no load test of an induction motor representative of ?

COURSE OUTCOME 3:

1.A CE amplifier when bypassed with a capacitor at the emitter resistance has ____
2. A transistor has h_{ie} =1KΩ and h_{fe}=60 with an bypassed emitter resistor R_e=1kΩ. What will be the input resistance and output resistance?

COURSE OUTCOME 4:

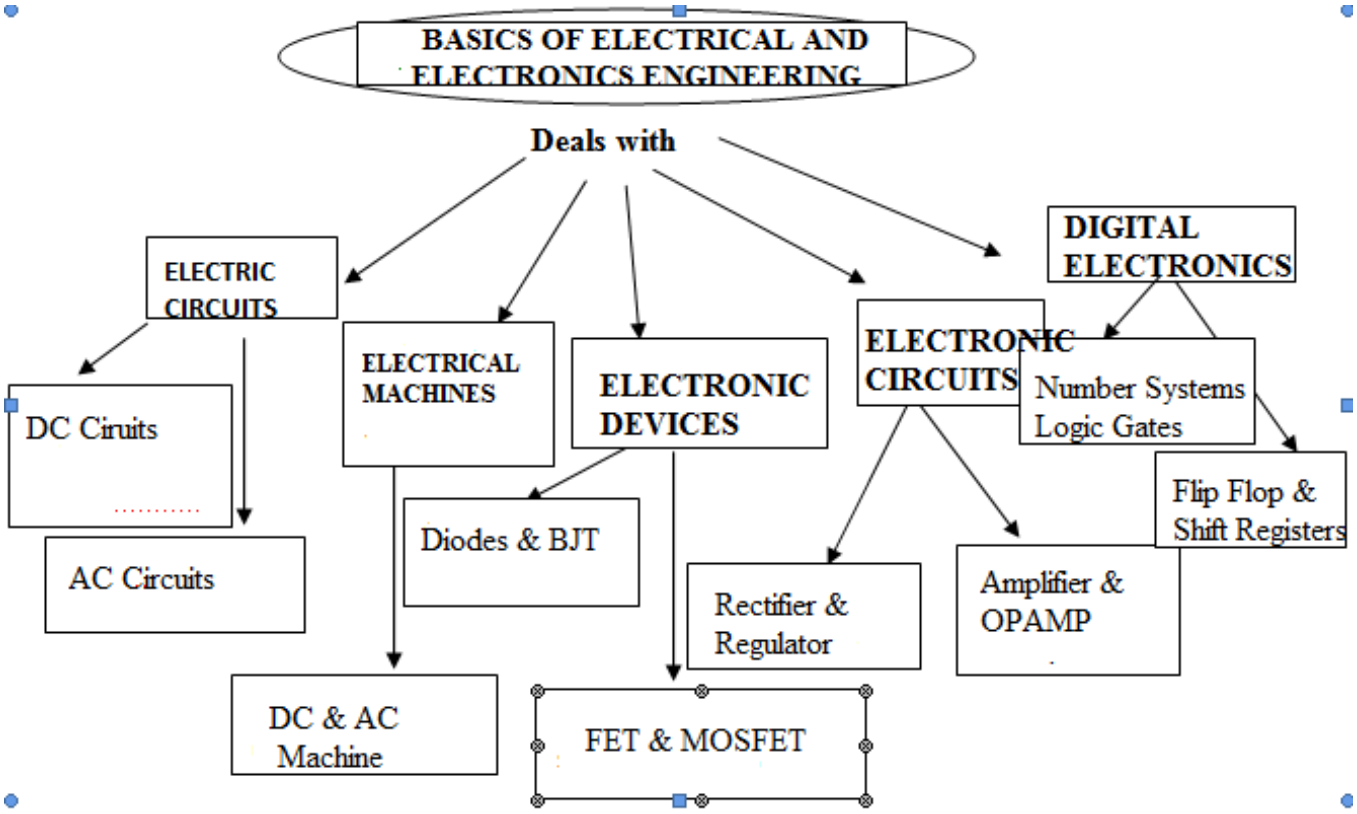
1.For a half wave or full wave rectifier the Peak Inverse Voltage of the rectifier is always
2.With zero volts on both inputs, an OP-amp ideally should have an output.

COURSE OUTCOME 5:

1.The following hexadecimal number $(1E.43)_{16}$ is equivalent to_____

2.In an SR latch built from NOR gates, which condition is not allowed_____

CONCEPT MAP



COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I – ELECTRIC CIRCUITS	
1	Ohm‟s law, Kirchhoff‟s Laws	1
2	Reduction of series and parallel circuits	2
3	Solving simple DC Circuits	1
4	Single phase AC circuit fundamentals	1
5	Power, Power factor	1
6	Solving simple AC circuits	2
7	Introduction to three phase AC circuits	1

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT II - ELECTRICAL MACHINES		
1	DC MACHINE: Principle of Operation DC Motor	1
2	Types-Torque equation	1
3	Speed-Torque characteristics	1
4	Losses and efficiency- Speed control of DC motors	1
5	Electric Braking	1
6	AC MACHINES: Single phase Transformers - Construction and working principle	1
7	Three phase Induction Motor-construction–Principle of operation	1
8	Torque Equation-Speed -Torque Characteristics	1
9	Single Phase Induction Motor Principle of operation-types – Industrial Applications.	1
S.NO	**TOPIC**	**NO OF HOURS REQUIRED**
UNIT III - ELECTRONIC DEVICES		
1	Operation of PN junction diodes, VI characteristics	1
2	Zener diode	1
3	BJT, types-CB, CE, CC configurations, input and output characteristics	2
4	JFET - working principle and characteristics - Comparison of BJT and FET.	1
5	MOSFET-types, principle of operation and characteristics	2
6	Opto Electronic Devices -Principles and Applications	2
S.NO	**TOPIC**	**NO OF HOURS REQUIRED**
UNIT IV - ELECTRONIC CIRCUITS : (Qualitative analysis only)		
1	Half wave and full wave rectifier, capacitive filters,	2

2	Zener voltage regulator	1
3	RC- coupled amplifier, frequency response	1
4	RC phase shift oscillator	1
5	Linear Integrated Circuits: Operational amplifiers, Ideal op-amp characteristics	1
6	Inverting and Non-inverting amplifier	1
7	Op-amp applications - Adder- Subtractor, integrator	1
8	Differentiator, comparator, zero crossing detector.	1
S.NO	**TOPIC**	**NO OF HOURS REQUIRED**
UNIT V - DIGITAL ELECTRONICS		
1	Number systems-representation of signed numbers	1
2	1‟s complement and 2‟s complement,	1
3	Logic gates	1
4	Half adder, Full adder	2
5	Flip flops, RS,JK,JK Master slave, D and T type	2
6	Counters	1
7	Shift Register	1

COURSE DESIGNERS:

1. Kannan P Assistant Professor/ECE kannanece@francisxavier.ac.in

HoD/Mech

21ME1513	COMPUTER AIDED ENGINEERING GRAPHICS	L	T	P	C
		2	0	4	4

Prerequisites for the course

NIL

Objectives

1. To develop graphic skills in students.
2. Train to practice engineering graphics through drafting software.

UNIT I	INTRODUCTION	7

Computer aided drafting software. Simple Geometric constructions - draw and modify commons line Thickness-Lettering Practice-Title block, Dimensioning practice as per BIS conventions

UNIT II	ORTHOGRAPHIC PROJECTION	9

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

UNIT III	SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES	9

Sections of regular solids as per BIS conventions - Constructing sectional views of simple objects and components - Development of lateral surfaces of regular solids-Projection of truncated solids .

UNIT IV	ISOMETRIC PROJECTIONS	5

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones ,Isometric view of simple components-flange, cylinder, chimney, lamp shades, valve, Brackets

UNIT V	PERSPECTIVE PROJECTIONS	5

Perspective projection of prisms, pyramids and cylinders by visual ray method.

S.No	List of Experiments	CO
1.	Basic drawing construction	C01, CO6
2.	Projection of simple Geometric objects and engineering components	C02, CO6
3.	Construction of simple objects and components sectional views	C03, CO6
4.	Projection of truncated solids	C04, CO6
5.	Perspective projection of solids	C05, CO6
	Total Periods	**35 Theory +40 Lab**

Laboratory Requirements

SYSTEM REQUIREMENTS

(For a batch of 30 Students)

Hardware:

1. Intel i3 core due processor with 4GB ram with 500GB hard disk – 30 Nos.
2. Laser Printer – 1 No.

Software:

Drafting package – AutoCAD – Adequate license (Open source)

Suggestive Assessment Methods

Drawing sheet submission using drafting software (30Marks)	Model (20 Marks)	End Semester Exams (50 Marks)
30	20	50

Outcomes

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

CO.1: Use of drafting software to draw basic geometrics, text , dimensions and title block
CO.2: Solve projections of solid problems and draw graphically
CO.3: Develop projections of sectioned solids and their developmental surface.
CO.4: Develop isometric views from orthographic projections
CO.5 Draw Perspective projections of simple solids
CO.6: Develop orthographic ,isometric and perspective projection and development of surfaces using drafting software.

Text Books

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited (2016)
2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2015)

Reference Books

1. Kumar M.S., "Engineering Graphics", D.D. Publications, (2015)
2. Shah M.B. and Rana B.C., "Engineering Drawing", Pearson Education (2009)
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I & II combined), Subhas Stores, Bangalore, (2007)
4. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008)
5. Parthasarathy N.S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, (2015)

Publication of Bureau of Indian Standards:

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

5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

Special points applicable to end semester examination on Engineering Graphics:

1. There will be two questions in the end semester examination using drafting tool.
2. All questions will carry equal marks of 25 each making a total of 50

Web Recourses

1. http://nptel.ac.in/courses/112103019
2. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html

CO Vs PO Mapping and CO Vs PSO Mapping

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

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	DRAWING SHEETS IN SOFTWARE	DRAWING SHEETS IN SOFTWARE	DRAWING SHEETS IN SOFTWARE	MODEL	END SEM EXAM
REMEMBER					
UNDERSTAND					
APPLY	10	10	10	20	50
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Drafting software to draw basic geometrics, Text , Dimensions and Title block

1. What are the two systems of placing dimensions on a drawing? Illustrate your answer with
   sketches.
2. Show by sketches the difference between (i) continuous or chain dimensioning and (ii) progressive or parallel dimensioning. What are the advantages of one above the other?

COURSE OUTCOME 2: Students will be able to Solve projections of solid problems and draw graphically

A pentagonal pyramid of base side 25mm and height 40mm, is resting on the ground on one of its triangular faces. The base edge of that face is inclined 30o to VP. Draw the projections of the solid.

1. A hexagonal prism has side 25mm and height 50mm has a corner of its base on the ground and the long edge containing that corner inclined at 30o to HP and 45o to VP. Draw the projections of the solid.

COURSE OUTCOME 3: Students will be able to Develop projections of sectioned solids and their developmental surface.

1. A cylinder of base diameter 50mm and height 60mm rest on its base on HP. It is cut by a plane perpendicular to VP and inclined at 45^0 to HP. The cutting plane meets the axis at a distance 15mm from its top base. Draw the sectional plan and true shape of the section.
2. A regular hexagonal pyramid side of base 30 mm and height 60 mm is vertically on its base on HP, such that two of its sides of the base are perpendicular to VP. It is cut by a plane inclined at 30° to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid.

COURSE OUTCOME 4: Students will be able to Develop isometric views from orthographic projections

1. A cone of diameter 50 mm and axis 70 mm rests on its base on HP. A section plane perpendicular to VP and inclined at 30° to HP cuts the solid and passes through a point on axis which is 40 mm above HP. Draw the isometric view of a truncated cone.

2. A pentagonal pyramid of base edge 25 mm and height 65 mm rests vertically on its base on the HP such that one of its base edge parallel to VP. It is cut by a plane, parallel to HP and perpendicular to VP and passes through a point 25 mm from the apex. Draw the isometric view of the frustum of pyramid.

COURSE OUTCOME 5: Students will be able to Draw Perspective projections of simple solids

1. Draw the perspective view of a square prism of base side 40mm and height 50mm. one vertical lateral face is parallel to PP and 30mm away from it. The station point is 80mm from PP, 80mm above the base and 60mm to the right of the axis of the prism.

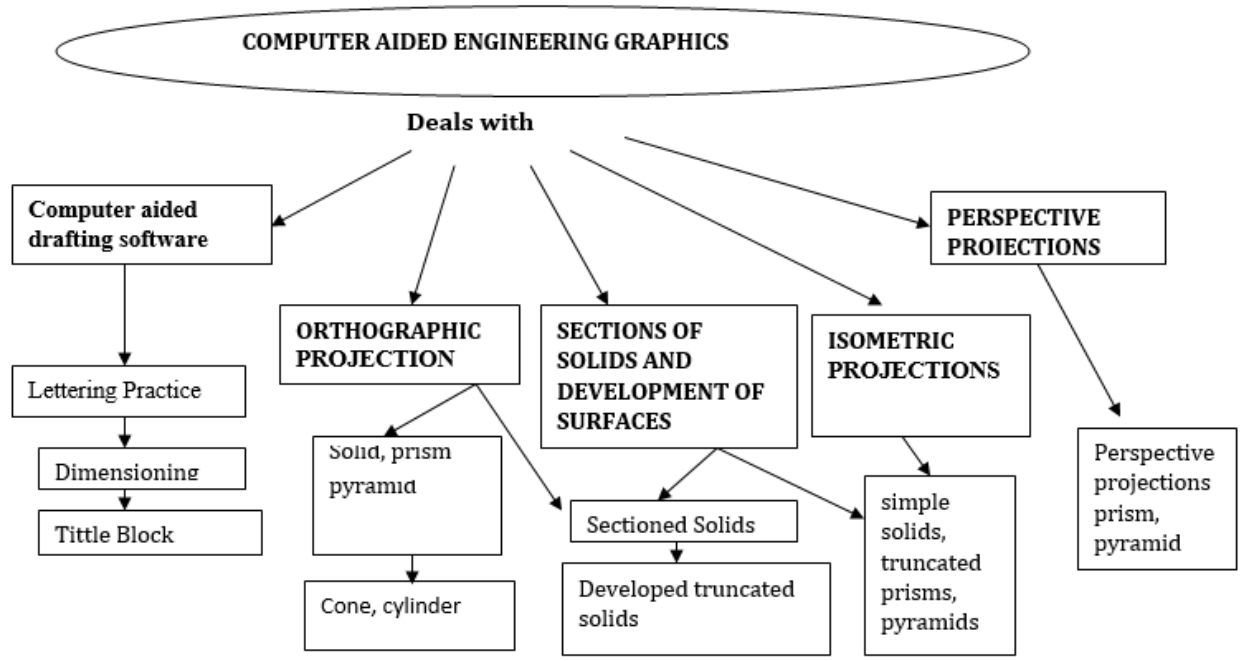
2.A hexagonal pyramid of base side 25mm and axis length 50mm is resting on GP on its base with a side of base is parallel to and 20mm behind PP. The station point is 60mm

above GP and 80mm in front of PP and lies in a central plane which is 50mm to the left of the axis of the pyramid. Draw the perspective view of a pyramid.

COURSE OUTCOME 6: Students will be able to Develop Orthographic ,isometric and perspective projection and Development of surfaces using drafting software

1. A hexagonal pyramid of base side 30 mm axis length 60 mm is resting on HP on one of its base corners with its axis inclined at 35˚ to HP and parallel to VP. Draw its projections.
2. A cylinder of base diameter 50mm and axis length 50mm is placed horizontally on GP on its base. The axis of the cylinder is 35mm behind PP. The station point is 70mm in front of PP and 70mm above the GP and is 50mm to the left of the axis. Draw the perspective projection of the cylinder.

CONCEPT MAP



COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I - INTRODUCTION	
1	Computer aided drafting software. Simple Geometric constructions -Title block	2

2	draw and modify commons line Thickness	2
3	Lettering Practice-Title block[	2
4	Dimensioning practice as per BIS conventions	1
UNIT II - ORTHOGRAPHIC PROJECTION		
5	Projection of simple solids like prisms, when the axis is inclined to one reference plane by change of position method	1
6	Projection of simple solids like prisms-hexagonal prism	1
7	Projection of simple solids like prisms-pentagon	1
8	Projection of simple solids like prisms-Cube	1
9	Projection of simple solids like pyramids-hexagon	1
10	Projection of simple solids like pyramids- pentagon	1
11	Projection of simple solids like cylinder	2
12	Projection of simple solids like cone	**1**
UNIT III - SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES		
13	Sections of regular solids as per BIS conventions - Constructing sectional views of simple objects and components –hexagonal prism	2
14	Constructing sectional views of simple objects and components –square prism	1
15	Constructing sectional views of simple objects and components –pentagonal prism	1
16	Constructing sectional views of simple objects and components – square pyramid	1
17	Development of lateral surfaces of regular solids-hexagonal prism, square prism, pentagonal prism	2
18	Development of lateral surfaces of regular solids-Projection of truncated solids . hexagonal pyramid,	2

	square pyramid, pentagonal pyramid.	
UNIT IV- ISOMETRIC PROJECTIONS		
19	Principles of isometric projection, isometric scale isometric projections of simple solids	1
20	truncated prisms	1
21	cylinders and cones	1
22	Isometric view of simple components-flange, cylinder, chimney,	1
23	Isometric view of simple components lamp shades, valve, Brackets	1
UNIT V- PERSPECTIVE PROJECTIONS		
24	Perspective projection of prisms-square prism	1
25	Perspective projection of prisms –pentagonal prism	1
26	Perspective projection of pyramids –square pyramid	1
27	Perspective projection of pyramids –Hexagonal pyramid	1
28	Perspective projection of prisms- cylinders	1

COURSE DESIGNERS:

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HoD/Mech

21CS2512	Python Programming (Common for Mechanical and Civil)	L	T	P	C
		1	0	2	3

Prerequisites for the course

- Problem Solving Techniques, Logical Thinking

Objectives

1. To know the features of Python.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and use function calls.
4. To use Python data structures – strings, lists, tuples, dictionaries.
5. To work with files in Python.
6. To handle exceptions.

UNIT I	INTRODUCTION TO PYTHON	3

Need for Python for Mechanical Engineers – Modes of Python - values and data types: Variables - expressions - statements – Operators - Input and Output – comments.

UNIT II	CONTROL FLOW, FUNCTIONS	3

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Functions: function definition and use, parameters and arguments, recursion.

UNIT III	STRING, LIST, TUPLES	3

Strings: string slices, string functions and methods.
Compound data - Lists: list operations - list slices - list methods - list loop.
Tuples: tuple assignment - tuple as return value

UNIT IV	DICTIONARY, FILES AND EXCEPTION HANDLING	3

Dictionaries: operations and methods
Files and exception: text files, reading and writing files, Command line argument, Errors: Syntax Errors, Runtime errors, Logical Errors – Exceptions – handling exceptions

UNIT V	MODULES AND PACKAGES	3

Modules, packages, Numpy, Seaborn, Pandas

S.No	List of Experiments	CO
1	Python Program using conditional statements	**CO1**
2	Python Program using looping statements	CO2
3	Python Programs using functions	CO2
4	Python Programs using string	CO3
5	Python Programs using list	CO3

6	Python Programs using tuples and dictionaries	CO3	
5	Python Programs using files	CO4	
7	Python Programs to handle exceptions	CO4	
8	Programs using Python library – NumPy, Pandas, Seaborn	CO5	

Total Periods	**15 Theory +30 Lab**

Laboratory Requirements

- 60 Systems with windows / LINUX operating system with python IDLE or equivalent.

Continuous Assessment Test (20 Marks)	**Lab Components Assessments (30 Marks)**	**End Semester Practical Exams (50 Marks)**
1. Descriptive Questions 2. Formative Multiple Choice Questions	1. Lab Experiments 2. Model Examination	1. Descriptive Questions 2. Formative Multiple Choice Questions

Outcomes

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

CO1: Write simple Python programs for solving problems using conditional statements.
CO2: Write Python programs for solving problems using looping statement and list and decompose a Python program into functions.
CO3: Represent data using Python strings, arrays, tuples, and dictionaries and solve computational problems using them.
CO4: Read and write data from/to files in Python programs and handle exceptions while dealing with data.
CO5: Write modules and packages and use Numpy , Seaborn and Pandas libraries in real time to solve scientific problems.

Text Books

1. Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition,Shroff/O'Reilly Publishers, 2016
3. José M. Garrido, "Introduction to Computational Models with Python", CRC Press, 2015.

Reference Books

1. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2", Network Theory Ltd., 2011.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press , 2013

3. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, 2016.
4. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2012.

Web Resources

1. https://nptel.ac.in/courses/106/106/106106182/
2. https://www.pythonprogramming.in/numpy-tutorial-with-examples-and-solutions.html
3. https://pythonprogramming.net/matplotlib-python-3-basics-tutorial/
4. https://www.pythonprogramming.in/pandas-examples.html
5. https://www.geeksforgeeks.org/python-seaborn-tutorial/
6. https://www.w3resource.com/python-exercises/pandas/index.php
7. https://www.w3schools.com/python/numpy/default.asp

CO Vs PO Mapping and CO Vs PSO Mapping

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

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**Lab Experiments**	**Model Lab**	**END SEM PRACTICAL EXAM**
REMEMBER	20	10			
UNDERSTAND	40	20			
APPLY	40	50	100	100	80
ANALYZE		20			20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

2. Write a Python Program to read the unit of electricity consumed in a house and calculate the amount to be paid for the electricity consumed. The bill amount should be calculated as per the given specification:
    a. For 0 to 100 units the per unit is ₹ 0/-
    b. For 0 to 200 units, for the first 100 unit the per unit cost is zero and the next 100 units, the consumer shall pay ₹ 1.5 per unit.
    c. For 0 to 500 units, the consumer shall pay ₹ 0 for the first 100 units, for the next 100 units the consumer shall pay ₹ 2 per unit, for the next 300 units the unit cost is ₹3.00/- **(Apply)**
3. Explain in detail about the various conditional statements that are supported by Python.
   (Understand)
4. Differentiate variables and constants. **(Analyse)**

COURSE OUTCOME 2:

1. Write a Python Program to Read a Number n and Compute n+nn+nnn. **(Apply)**
2. Differentiate break and continue. **(Analyse)**
3. Define function. **(Remember)**

COURSE OUTCOME 3:

1. What is printed by the following statements? **(Appy)**

```
s = "engineering"
r = ""
for item in s:
        r = item.upper() + r
print(r)
```

2. Is string is mutable. Justify your answer. **(Understand)**
3. List out some compound data type that are supported by python. **(Remember)**

COURSE OUTCOME 4:

1. What happens if the file is not found in the following Python code? **(Apply)**

```
a=False
while not a:
try:
        f_n = input("Enter file name")
        i_f = open(f_n, 'r')
except:
        print("Input file not found")
```

2. Write a Python Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File. **(Apply)**
3. How will you handle exception when it is raised? Explain. **(Understand)**

COURSE OUTCOME 5:

1. Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module. **(Apply)**
2. Explain in detail about modules and packages in Python. **(Understand)**

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT – I INTRODUCTION TO PYTHON PROGRAMMING		
1	Need for Python for Mechanical Engineers – Modes of Python - values and data types: Variables - expressions – statements	1
2	Operators	1
3	Input and Output – comments.	1
UNIT – II CONTROL FLOW , FUNCTIONS		
4	Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else)	1
5	Iteration: state, while, for, break, continue, pass	1
6	Functions: function definition and use, parameters and arguments, recursion.	1
UNIT – III STRING, LIST, TUPLES		
7	Strings: string slices, string functions and methods.	1
8	Lists: list operations - list slices - list methods - list loop.	1
9	Tuples: tuple assignment - tuple as return value	1
UNIT IV– DICTIONARY, FILES AND EXCEPTION HANDLING		
10	Dictionaries: operations and methods	1

11	Files and exception: text files, reading and writing files, Command line argument	1
12	Errors: Syntax Errors, Runtime errors, Logical Errors – Exceptions – handling exceptions	1
UNIT – V MODULES AND PACKAGES		
13	Modules, packages	1
14	Numpy	1
15	Seaborn, Pandas	1
Lab Experiments		
16	Python Program using conditional statements	2
17	Python Program using looping statements	3
18	Python Programs using functions	3
19	Python Programs using string	3
20	Python Programs using list	3
21	Python Programs using tuples and dictionaries	3
24	Python Programs using files	3
25	Python Programs to handle exceptions	3
26	Programs using Python library – NumPy, Pandas, Seaborn	3

COURSE DESIGNERS:

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2. **Ms.J.Monica Esther, AP – IT – monicaesther@francisxavier.ac.in**
3. **Ms.M.Sharon Nisha, AP – IT – sharonnisha@francisxavier.ac.in**

HoD/Mech

21GE2502	ELECTRICAL AND ELECTRONICS LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

Basic science

Objectives

- To Implement Electric Circuits and Study the Characteristics of Electric Machine
- To study chacteristics of Electronic Devices and Circuits
- To Implement the Digital Circuits.

S.No	List of Experiments	CO
1	Verification of Ohm‟s and Kirchhoff‟s Laws	CO1
2	Measurement of Power and Power Factor in Single Phase RLC Circuit	CO1
3	Mechanical Characteristics of DC Shunt and Compound Motor	CO2
4	Load Test on 3 Phase Induction Motor and Electric Braking	CO2
5	Different Configuration of Bipolar Junction transistor & Field Effect Transistor	CO3
6	Study of characteristics of Zener diode.	CO3
7	Study of Half Wave and Full Wave Rectifiers with and without Filters	CO4
8	RC Coupled Amplifier & Application of Operational Amplifier : Adder, Subtractor, Integrator, and Differentiator	CO4
9	Study of Logic Gates and Implementation of Binary Adder / Subtractor	CO5
10	Implementation of Shift registers & Modulo – 16 Counter	CO5

Total Periods :60

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
EXPERIMENTATION – RECORD	EXPERIMENTATION - VIVA

Outcomes

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

CO1 Design the Electric circuits.

CO2 Analyse the various characteristics of AC and DC Machine.

CO3 Understand the different types of Electronic Devices
CO4 Design the electronic circuits
CO5 Design of digital circuits.

Laboratory Requirements

1. Voltmeter – different ranges
2. Ammeter – different ranges
3. RPS
4. DC shunt motor
5. DC series motor
6. DC shunt motor – DC shunt generator set
7. Three phase alternator
8. Three phase synchronous motor

Reference Books

1. S.K Bhattacharya, K.M. Rastogi, Experiments in Basic Electric Engineering.2003.
2. A. M. Zungeru, J. M. Chuma, M. Mangwala, H. U. Ezea, Handbook of Laboratory Experiments in Electronics Engineering, 2016

Web Recourses

1. https://www.scribd.com/doc/63714438/Basic-Electrical-Engineering-Lab-Manual
2. https://nptel.ac.in/courses/122/106/122106025/
3. https://nptel.ac.in/courses/108/108/108108076/

CO Vs PO Mapping and CO Vs PSO Mapping

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

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