122ENI01	PROFESSIONAL ENGLISH-I (Embedded Course - Common to all branches)	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course prepares first semester Engineering and Technology students to:

- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.
- Present information in an appropriate oral form.
- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write anything convincingly with grammatical accuracy.

THEORY

UNIT I – Listening

Listening to news and understanding its perspectives - Listening to motivational speech to comprehend the purpose - Listening to technical talks to understand its significance - Listening to classroom lecture to equip content knowledge - Listening comprehension

UNIT II - Speaking

Everyday activities for day to day communication - Extempore/Impromptu to develop spontaneous thoughts - Self introduction to face interviews - Public speaking for persuading the audience - Movie reviews to promote critical thinking.

UNIT III- Reading

Newspaper reading to upgrade world knowledge - Reading Comprehension to analyze the text – Novels to improve creativity - Biography/Autobiography to synthesize experience - Technical articles for upgrading technical knowledge.

UNIT IV- Writing

Definitions - Instructions - Checklists – Recommendations - Essays - Invitation and quotation letters - Email etiquettes - Reports - Minutes of a meeting

UNIT V- Language Development

Technical vocabulary - Parts of speech - Articles - Tenses - Voices - Numerical adjectives - Question tags - Misspelled words - Singular and plural nouns - Modals - Conditionals.

ENGLISH LABORATORY

Unit 1: Listening

Listening audios and answering MCQs - Watching video clips on famous speeches, motivational videos, and documentaries and answering MCQs - TED talks.

Unit 2: Speaking

Prepared talk - Story knitting - Picture talk - Brainstorming - Debate - Group discussion - Elevator speech - Mock HR interviews - Story narration - Miming - Short skits.

Unit 3: Reading

Classification - Alphabet test - Logical sequence of words - Statement & conclusions - Statement & courses of action - Situation reaction test - Theme detection - Deriving conclusions from passages.

Unit 4: Writing

Resume writing - Letter writing (Covering letter - Follow up letter - Letter of thanks giving - appreciation - Gratitude) - Paragraph writing - Jumbled paragraph - Error spotting.

Unit 5: Career Skills

Vocabulary Test (GRE, TOEFL, TOEIC & CAT Exam words) - Confused Pair of words - Contronyms - Time management – Stress management - Decision making - Negotiation - Sentence correction.

TOTAL HOURS: 60

Lab Requirements:

1. Teacher console and systems for students.

2. English Language Lab Software

3. Career Lab Software

OUTCOMES:

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

CO1: Listen and comprehend the various strategies of listening and its significance in their area of specialization successfully.

CO2: Speak appropriately and effectively in varied formal and informal contexts.

CO3: Read and comprehend texts effortlessly and understand the prevailing practices of testing in the recruitment process by the corporate and the institutional selection processes.

CO4: Communicate the corporate and social requirements in an impressive written mode.

CO5: Understand the basic grammatical structures and its applications and enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.

TEXT BOOKS:

1. Board of editors. **Fluency in English: A Course book for Engineering and Technology**. Orient Blackswan, Hyderabad: 2016.
2. Sudharshana. N. P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.
3. Uttham Kumar. N. **Professional English - I** (with work book). Sahana Publications, Coimbatore, 2016.
4. Agarwal R. S. A Modern Approach to Verbal and Non-verbal Reasoning. Chand & Co., New Delhi, 2012.
5. Ashraf Rizvi M. Effective Technical Communication. TATA McGraw Hill, New Delhi, 2007.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad, 2015.
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
6. Lingua: Essays for TOEFL/IELTS, Dreamtech Press, New Delhi, 2016.
7. Lily Mangalam, Global English Comprehension, Allied Publishers Pvt. Ltd., New Delhi, 2014.
8. Sharon Weiner Green and Ira K. Wolf, Barron's GRE, Glagotia Publications Pvt. Ltd., 18th Edition, New Delhi, 2011.
9. Mohamed Elias, R. Gupta's IELTS/TOEFL Essays, Ramesh Publishing House, 6th Edition, New Delhi, 2016.

122MAT02	MATRICES AND CALCULUS (Common to all branches)	L	T	P	C
		3	1	0	4

Course Objectives

- To understand the Eigen value problems.
- To learn the derivatives of multivariable functions and applications.
- To solve differential equations of certain types, including systems of differential equations that they might encounter in engineering subjects.
- To understand double and triple integration concepts.
- To study vector calculus comprising of surface and volume integrals along with the classical theorems involving them.

UNIT I MATRICES 12

Eigen values and eigenvectors of a real symmetric matrix –Properties – Cayley - Hamilton theorem (Statement and applications only) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form –Reduction of quadratic form to canonical formby orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Jacobians – Taylor's expansion– Maxima and Minima – Method of Lagrangian multipliers.

UNIT III ORDINARY DIFFERENTIAL EQUATIONS 12

Second order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients-Applications to Engineering problems-Electric Circuits, Simple Harmonic Motions and Bending of beams.

UNIT IV MULTIPLE INTEGRALS 12

Double integration – Cartesian and polar co-ordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates –Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

UNIT-V VECTOR CALCULUS 12

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal, vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (Statement and applications only) – Simple applications involving cubes and rectangular parallelepipeds.

TOTAL HOURS = 60

Course Outcomes

After completing this course, the student will be able to

CO 1: Apply the matrix algebra concepts for solving practical problems.
CO 2: Compute extremities of a function using multivariable derivatives.
CO 3: Determine the solutions of ordinary differential equations by various methods which have an application in their core subjects.
CO 4: Determine the area and volume in 2-dimension and 3-dimension respectively using multiple integrals.
CO 5: Expertise the concept of vector calculus and apply in core subjects.

TEXT BOOKS

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 10th edition New Delhi 2016.
2. Grewal. B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publications, Delhi, 2017.

REFERENCES

1. T. Veerarajan, "Engineering Mathematics" ,Tata McGraw-Hill Publishing company, New Delhi, 2014.
2. Kandasamy.P, Thilagavathy,K., &Gunavathi.K., "Engineering Mathematics for first year "., S.Chand & Company Ltd., New Delhi,2014.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11thReprint, 2010.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
5. V. Prameelakaladharan and G.Balaji, "Engineering Mathematics - I", 3rd Edition, Amrutha marketing, Chennai, 2017.

122PHT03	ENGINEERING PHYSICS (Common to all branches)	L	T	P	C
		2	0	0	2

Objectives:

At the end of the course the students would be exposed to fundamental knowledge in

- Different engineering subjects and applications.
- Acoustics in building and Non-destructive techniques.
- Application of lasers in engineering and technology.
- Basics of Quantum theory.
- Identification of structure of engineering materials.
- Atomic and nuclear related theories.

UNIT-1: ACOUSTICS AND ULTRASONICS 9

Sound – classification – characteristics of musical sound – loudness – Decibel – Intensity of sound – Weber-Fechner law – Reverberation and Reverberation time – Sabine's law – derivations – Absorption coefficient – Measurement of absorption coefficients – Factors affecting acoustics of buildings and their remedies.

Ultrasonic's – production – Magnetostriction effect – Magnetostriction oscillator – Piezoelectric effect – Inverse piezoelectric effect – Piezoelectric oscillator-Detection of ultrasonic waves-properties-Cavitations-Applications-NDT-pulse echo system-Determination of depth of sea.

UNIT-2: OPTICAL PHYSICS 9

Lasers – Spontaneous and Stimulated Emissions-Types of lasers-Nd-YAG, Helium-Neon, CO_2 -Semiconductor lasers [Homojunction and Heterojunction (qualitative)]-Interference-Air wedge and its applications- Michelson interferometer: construction, working, determination of wavelength and thickness.

UNIT-3: QUANTUM PHYSICS 9

Blackbody Radiation-Laws of blackbody Radiation-Planck's quantum theory of blackbody radiation(derivation)-Photo Electric Effect-Compton effect(derivation)-Matter Waves-De-Broglie's Concept-Schrodinger wave Equation-Time independent and Time dependent equations(derivations)-Physical significance of wave function-particle in a box (one dimensional case).

UNIT-4: PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity-Hook's law-stress- strain diagram-factors affecting Elasticity-Poisson's ratio-Bending Moment-Cantilever-Heavy Cantilever-Young's Modulus-Uniform and Non-uniform bending (Theory and Experiment). Modes of heat Transfer-Thermal Conductivity-Newton's Law of Cooling-Lee's disc Method-Radial Heat Flow-Cylindrical Shell Method-Thermal conductivity of Rubber-Heat conduction through a compound media.

UNIT-5: NUCLEAR AND ATOMIC PHYSICS 9

Nuclear fission-chain Reaction-Nuclear reactor-condition for sustained chain reaction-Controlled chain reaction-Pressurized water reactor (PWR)-Boiling water reactor (BWR)-Nuclear power plant-Nuclear fusion- Differences between fission and fusion-Raman effect-applications-Raman spectroscopy.

TOTAL HOURS: 45

COURSE OUTCOMES:

After successful completion of this course, the students should be able to:

CO1: Apply the Acoustics and NDT techniques and modern engineering tools necessary for engineering practice.

CO2: Categorize and illustrate the Lasers and its application to engineering

CO3: Apply the quantum concepts in engineering field.

CO4: Examine the elastic and thermal properties in various materials.

CO5: Discuss the role of nuclear physics in energy production.

REFERENCES:

1. Dr. R.N. Jayaprakash, Engineering Physics, Dhanam Publications, 2018.
2. Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
3. Palanisamy P.K.,Engineering Physics I,Scitech Publications, Chennai,2011.
4. Avadhanulu M.N. and Kshirsagar P.G., A Textbook of Engineering physics, S.Chand & Company Ltd, New Delhi,2005.

122CYT04	ENGINEERING CHEMISTRY (Common to all branches)	L	T	P	C
		2	0	0	2

Course objectives:

At the end of the course the students would be exposed to fundamental knowledge in

- To understand the chemistry behind water technology
- To understand the chemistry of Corrosion
- To acquaint the student with concepts of important photo physical and photochemical processes and spectroscopy
- To acquaint the students with the basics of fuels, and chemistry behind combustion process.
- To understand the basic concepts of phase equilibrium

UNIT I WATER TECHNOLOGY **9**

Physical, Chemical & Biological characteristics -Hardness of water - estimation of hardness (EDTA method) - Dissolved oxygen –determination and significances, Alkalinity – determination and significances - disadvantages of using hard water in boilers- Internal conditioning - phosphate, calgon and carbonate conditioning methods – External treatment: Zeolite, ion exchange methods - desalination – reverse osmosis and electrodialysis - domestic water treatment.

UNIT II CORROSION SCIENCE **9**

Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion –Measurement of corrosion (wt. loss method only) - factors influencing corrosion. Corrosion control: Cathodic protection - sacrificial anodic method and impressive cathode current method. Electroplating (Copper plating) and Electroless plating (Nickel plating).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY **9**

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency –Photophysical Process-Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation – applications.

UNIT IV FUELS AND COMBUSTION **9**

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) – petroleum – Fractional distillation - manufacture of synthetic petrol (Bergius process)- knocking- octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG). Combustion of fuels – (simple problems) flue gas analysis (ORSAT Method).

UNIT-V PHASE EQUILIBRIA **9**

Gibbs phase rule-definition of terms involved- Thermal analysis-application of phase rule to one Component system-water system – Sulphur system. Reduced Phase rule-application of phase rule to two Component system- lead-silver system - KI-water system and Ferric Chloride water system

Course Outcomes:

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

CO1: Developing the knowledge of chemistry behind water technology
CO2: Understanding the chemistry of Corrosion
CO3: Applying the basic concepts of photon on matter
CO4: Understanding basics of fuels, and chemistry behind combustion process.
CO5: Understanding the basic concepts of phase equilibrium

Text Books

1. P.C. Jain and Monika Jain, Engineering Chemistry, DhanpatRai and Sons, NewDelhi 2004.16th Edition.
2. N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry,2nd Edition.PHI Learning PVT., LTD, New Delhi, 2008. 3rd Edition.
3. K. Sivakumar, Applied Chemistry, Sahana Publishers, Coiambatore 2022.4th Edition.

Reference Books

1. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand & Co., Ltd. NewDelhi. 2008. Reprint edition.
2. B. K. Sharma, Engineering Chemistry, 3rd edition Krishna Prakashan Media (P)Ltd., Meerut, 2001.
3. ArunBhal, B.S. Bhal, G. D. Tuli, Essentials of Physical Chemistry, S. Chand & Co., Ltd. New Delhi. 26th Edition.
4. P. W. Atkins & Julio de Paula, Atkins' Physical Chemistry, Oxford University Press York, 7thEdn, 2002.
5. ShashiChawla, A Text Book of Engineering Chemistry, 3rd Edition, DhanpatRai&New Delhi, 2007.
6. S. Vairam, P. Kalyani&Suba Ramesh, Engineering Chemistry, IstEdn, John Wiley &Sons, India, 2011.
7. Lee J.D., Concise Inorganic Chemistry, 7th Edn, Blackwel Science Publications Oxford, London, 2004.

122PPT05	PYTHON PROGRAMMING (Common to all Circuit Branches)	L	T	P	C
		3	0	0	3

OBJECTIVE(S):

- To know the basics of algorithmic problem solving
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

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

UNIT II DATA EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL STATEMENTS AND FUNCTIONS 9

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

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: Create-add- delete from a Dictionary- Operations associated with pairs of data, and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, date and time, errors and exceptions, handling exceptions, debugging, modules, packages; Illustrative programs: word count, copy file. Case Study: Python Libraries (Numpy, Pandas, SciPy, PyGame).

TOTAL HOURS: 45

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems
CO2: Read, write, execute by hand simple Python programs.
CO3: Structure simple Python programs for solving problems and decompose into functions.
CO4: Represent compound data using Python lists, tuples, and dictionaries.
CO5: Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016. (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, -"An Introduction to Python" – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCE BOOKS:

1. John V Guttag, -"Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, -"Introduction to Programming in Python: An Inter-Disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, -Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, - "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
5. Charles Dierbach, - "Introduction to Computer Science using Python: A Computational Problem"- Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, - "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

122CMT06	BASIC CIVIL AND MECHANICAL ENGINEERING (Common to ECE, BME & EEE)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain the knowledge in surveying and construction materials.
- To understand the building structures.
- The student should familiar with foundry, welding and forging processes.
- To know the working of IC engines and Boilers.
- To gain the knowledge about sources of energy and refrigeration.

PART-A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 09

Surveying: Objects, types, classification, principles, measurements of distances, angles, leveling, determination of areas, illustrative examples.
Civil Engineering Materials: Bricks, stones, sand, cement, concrete, steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 10

Foundations: Types, Bearing capacity, Requirement of good foundations.
Superstructure: Brick masonry, stone masonry, beams, columns, lintels, roofing, flooring, plastering, Mechanics, Internal and external forces, Stress, Strain, Elasticity, Types of Bridges and Dams, Basics of Interior Design and Landscaping.

PART-B – MECHANICAL ENGINEERING

UNIT III FOUNDRY WELDING AND FORGING 10

Foundry: Introduction - Patterns –materials. Types of pattern and pattern allowances. Molding sand, types and properties, Molding procedure. Welding: Definition and Classification, Gas welding, Oxy Acetylene welding, Types of flames, advantages and disadvantages of gas welding. Resistance welding - Classification, Spot welding and Seam welding. Soldering, Definition and Classification. Brazing – Definition and Classification. Forging: Types of Forging, Differences between Hot working and Cold working processes.

UNIT IV IC ENGINES & BOILERS 08

Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and Two stroke cycles, Comparison of four stroke and two stroke engines, Boilers: Introduction of boilers, classification, Lancashire boiler, Babcock and Wilcox boiler, list of boiler mountings and accessories and applications (no sketches).

UNIT V SOURCE OF ENERGY & REFRIGERATION 08

Sources of energy: Introduction, conventional and non-conventional sources of energy, examples, solar energy, hydro power plant. Introduction to refrigeration and air-conditioning, COP, properties of refrigerants and types of refrigerants, working principle of vapour compression & vapour absorption refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner.

TOTAL HOURS: 45

COURSE OUTCOMES:

The students will have an ability to

CO1: Explain the usage of construction material and proper selection of construction materials.

CO2: Design building structures.

CO3: Gain knowledge on manufacturing processes like foundry, welding and forging.

CO4: Demonstrate working principles of petrol and diesel engine and the components used in power plants.

CO5: Explain the components of Refrigeration and Air conditioning cycle.

TEXT BOOKS:

1. Ranganath G and Channankaiah, "Basic Engineering Civil & Mechanical", S.S.Publishers, 2014.
2. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 3rd Edition, 2018.

REFERENCE BOOKS:

1. Shanmugasundaram. S and Mylsamy. K, "Basics of Civil and Mechanical Engineering", Cenage Learning India Pvt. Ltd, New Delhi, 2012.
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd, 3rd Edition reprint, 2013.
3. Gopalakrishna K R, "Elements of Mechanical Engineering", Subhas Publications, Bangalore, 2008.
4. Khanna O.P, Foundry Technology, Dhanpat Rai Publishing Co. (P) Ltd, 2011.
5. Venugopal.K and Prabhu Raja.V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, 2015.
6. Shantha Kumar S R J, "Basic Mechanical Engineering", Hi-Tech Publications, Mayiladuthurai, 2001.

122HST07	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE **3**

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

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE **3**

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

UNIT III FOLK AND MARTIAL ARTS **3**

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

UNIT IV THINAI CONCEPT OF TAMILS **3**

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

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE **3**

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

TOTAL HOURS: 15

REFERENCE BOOKS:

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

122PHP07	ENGINEERING PHYSICS LABORATORY (Common to all Circuit Branches)	L	T	P	C
		0	0	2	1

Course Objectives:

- To understand the practical concepts of interference and diffraction.
- To understand the concept of velocities of sound in different liquids.
- To get better knowledge of modulus of elasticity.
- To understand the concepts of thermal conductivity.
- To understand the concept of viscosity of liquids.

LIST OF EXPERIMENTS

1. (a) Determination of laser Parameters-Wavelength.
   (b) Particle size determination using diode laser.
1. Determination of Young's modulus of the material- uniform bending.
2. Determination of (i) the moment of inertia of the disc and (ii) the rigidity modulus of the material of a wire.
3. Determination of thickness of a thin Wire-Air wedge method.
4. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
5. Determination of wavelength of mercury spectrum-spectrometer grating.
6. Determination of Young's modulus of the material-Non uniform bending.
7. Determination of viscosity of liquid-Poiseuille's method.
8. Determination of acceleration due to gravity 'g' – Compound pendulum.
9. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
10. Determination of wavelength of monochromatic light – Newton's ring method.

Course Outcomes:

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

1. Understand the moduli of elasticity of various materials.
2. Understand the phenomenon of diffraction and interference of light using optical components.
3. Acquire knowledge of viscosity and compressibility of various liquids.
4. Understand the concept of heat transfer through conductors and bad conductors using Lee's disc.
5. Acquire knowledge about acceleration due to gravity.

TOTAL HOURS: 45

122PPP08	PYTHON PROGRAMMING LABORATORY (Common to all Circuit Branches)	L	T	P	C
		0	0	2	1

OBJECTIVE(S):

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS:

1. To Implement python scripts using Variables and operators
2. To Demonstrate Operator precedence to evaluate an expression
3. Display grade of a student using elif statement
4. Implement Floyd triangle using for loop
5. Checks the given number is prime or not using while loop
6. Compute the GCD of Numbers and largest number in a list using functions
7. Finding factorial of a given number using recursive function.
8. Take a list of words and returns the length of longest one using strings
9. To perform linear and binary search using strings
10. To implement list as arrays (multiply 2 matrices)
11. To demonstrate use of list & related functions
12. To demonstrate use of tuple, set& related functions
13. To demonstrate use of Dictionary& related functions
14. Programs that take command line arguments (word count)
15. To import specific items from a library module.
16. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL HOURS: 45

COURSE OUTCOMES:

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

CO1: Write, test, and debug simple Python programs.
CO2: Implement Python programs with conditionals and loops.
CO3: Develop Python programs step-wise by defining functions and calling them.
CO4: Use Python lists, tuples, dictionaries for representing compound data.
CO5: Read and write data from/to files in Python

LIST OF EQUIPMENTS AND SOFTWARE FOR A BATCH OF 30 STUDENTS

Hardware:
LAN System with 30 Nodes (OR) Stand-alone PCs -30 No's.
Printer – 3 No's.
Software:
Operating System : Linux / Windows.
Open Source Software: Python.
Database : MySQL.
Open Source Platform: XAMPP, Eclipse IDE

222ENT01	PROFESSIONAL ENGLISH-II (Embedded Course - Common to all branches)	L	T	P	C
		3	0	0	2

COURSE OBJECTIVES:

The Course prepares second semester Engineering and Technology students to:

- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.
- Present information in an appropriate oral form.
- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write anything convincingly with grammatical accuracy.
- Nurture the holistic perspective of industry readiness

UNIT I: Listening

Theory

Conversation - Telephonic conversation - Class memory quiz - Interviews of famous persons - A scene from a film - Podcast - Stories - Product description - Process description

English Laboratory

Scientific lectures - Educational videos - Gap filling exercises - Presentations - Formal job interviews - Introduction to classmates - Debates - Panel discussion - INK talks

UNIT II: Speaking

Theory

Exchanging personal information - Greeting - Leave taking - Introducing friends - Reporting - Role play - Describing a person/place/thing - Small talk - Celebrity interview

English Laboratory

Narrating personal experiences - Presentation - Information gap - Simulations - Find the difference - Giving and asking for directions - News brief - Alibi - Untranslatable

UNIT III: Reading

Theory

Short stories: The Gift of the Magi, A Service of Love and The Last Leaf by O. Henry - Magazines - Jigsaw - Newspaper reports - Newspaper articles - Journals - Travelogues

English Laboratory

Brochures - Social media messages - Excerpts from literature - Editorials - Case studies - Critical reviews - Excerpts of interview with professionals - Technical texts - One word splash

UNIT IV: Writing

Theory

Developing hints - Note-making - Note-taking - Agenda - Advertisement - Transfer of information (Pie chart, Bar chart and Flow chart) - Précis writing and summarizing - Free writing - Short stories

English Laboratory

Letter writing - Essay writing - What if? - Poetry - Cubing - Defining technical terms - Character description - One-minute paper - Feedback

UNIT V: Language Development

Theory

Consonants & vowels - Phonetic transcription - British and American English - Infinitive and gerund - Types of sentences - Information and emphasis - Cause and effect - Purpose and function - Phrasal verbs

English Laboratory - Career Skills

Abbreviations and acronyms - Homonyms and homophones - Word formation - One word substitution - Compound nouns - Concord - Life etiquettes - Emotional intelligence - Notable Indian start-ups - Work ethic

TOTAL HOURS: 60

Lab Requirements:

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

OUTCOMES:

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

CO1: Listen and comprehend the various strategies of listening and its significance in their area of specialisation successfully.

CO2: Speak appropriately and effectively in varied formal and informal contexts.

CO3: Read and comprehend texts effortlessly and understand the prevailing practices of testing in the recruitment process by the corporates and the institutional selection processes.

CO4: Communicate the corporate and social requirements in an impressive written mode.

CO5: Understand the basic grammatical structures and its applications and enhance their verbal skills in the screening tests competently both for recruitment and pursuing higher studies as well.

TEXT BOOKS:

1. Board of editors. **Fluency in English: A Course book for Engineering and Technology**. Orient Blackswan, Hyderabad: 2016.
2. Sudharshana. N. P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.
3. Uttham Kumar. N. **Professional English - II** (with work book). Sahana Publications, Coimbatore, 2023.
4. Agarwal R. S. A Modern Approach to Verbal and Non-verbal Reasoning. Chand & Co., New Delhi, 2012.
5. Ashraf Rizvi M. Effective Technical Communication. TATA McGraw Hill, New Delhi, 2007.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad, 2015.
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges. Cengage Learning, USA: 2007.
6. Lingua: Essays for TOEFL/IELTS, Dreamtech Press, New Delhi, 2016.
7. Lily Mangalam, Global English Comprehension, Allied Publishers Pvt. Ltd., New Delhi, 2014.
8. Sharon Weiner Green and Ira K. Wolf, Barron's GRE, Glagotia Publications Pvt. Ltd., 18th Edition, New Delhi, 2011.
9. Mohamed Elias, R. Gupta's IELTS/TOEFL Essays, Ramesh Publishing House, 6th Edition, New Delhi, 2016.

222MAT02	PROBABILITY AND STATISTICS (Common to all branches)	L	T	P	C
		3	1	0	4

Course Objectives

- To impart the knowledge of basic probabilistic theory.
- To learn one dimensional discrete and continuous probability distributions occurring in natural phenomena.
- To extend the probability theory to two dimensional random variable and to study the statistical measures.
- To introduce the concept of sampling distributions and testing hypothesis techniques useful in decision making.
- To expose the statistical methods for analysis of variance and control limits.

UNIT I PROBABILITY AND RANDOM VARIABLES 9 + 3

Axioms of probability - Conditional probability - Total probability – Baye's theorem- Random variables - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II PROBABILITY DISTRIBUTIONS 9 + 3

Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions and their properties - applications.

UNIT III TWO-DIMENSIONAL RANDOM VARIABLES 9 + 3

Joint Probability Distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Central limit theorem (Statement and applications only for independent and identically distributed random variables).

UNIT IV TESTING OF HYPOTHESIS 9 + 3

Sampling distributions - Tests for single mean, proportion, difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-square test for Independence of attributes using contingency table and Goodness of fit.

UNIT V DESIGN OF EXPERIMENTS 9 + 3

Analysis of variance – Completely Randomized Design (CRD) (one way classification) – Randomized Block Design (RBD) (two way classification) - Latin Square Design (LSD) - Control charts for measurements - $\bar{x}$ chart, R-chart.

TOTAL: 45 + 15 = 60 PERIODS

Note: Use of approved statistical table is permitted in the examination.

Course outcomes

At the end of the course the student will be able to

CO 1: Apply probability concepts in real life problems.

CO 2: Identify and design probability distribution models and interpret.

CO 3: Use the concept of two dimensional random variables that helps to understand and analyze the statistical measures of probability functions.

CO 4: Draw inference & conclusion through hypothesis testing.

CO 5: Implement the knowledge of analysis of variance and control limits in real time applications.

TEXT BOOKS

1. Miller and Freund., "Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2012.

2. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw-Hill publishing company Limited, New Delhi, 2014.

REFERENCES

1. Spiegel, M.R, Schiller, J and Alu Srinivasan, R, "Schaum's Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi , 2010.

2. Gupta.S.C., & Kapoor,V.K., "Fundamentals of mathematical statistics", 11th edition, Sultan Chand & Sons publishers, New Delhi, 2013.

3. Ibe, O.C.,"Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.

4. Kandasamy.P,Thilagavathy,K.,&Gunavathi.K., "Probability, Statistics and Queueing Theory". S.Chand & Company Ltd., New Delhi, 2014.

5. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill edition, New Delhi, 2014.

CO-PO MAPPING

SEMESTER : II Course Name : **222MAT02 - PROBABILITY AND STATISTICS**

CO'S	Course Outcomes	Program Outcomes (PO)												Program Specific Outcomes (PSO)		
		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
CO 1	Apply probability concepts in real life problems.	3	3	3	1	1							2	2	2	
CO 2	Identify and design probability distribution models and interpret.	3	3	3	1	1							2	2	2	

CO 3	Use the concept of two dimensional random variables that helps to understand and analyze the statistical measures of probability functions.	3	3	3	2	2							2	2	2	
CO 4	Draw inference & conclusion through hypothesis testing.	3	3	3	2	2							2	2	2	
CO 5	Implement the knowledge of analysis of variance and control limits in real time applications.	3	3	2	2	2							2	2	2	

222EST03	ENVIRONMENTAL SCIENCE AND ENGINEERING (Common to all Branches)	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyse climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

UNIT III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT 6

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V SUSTAINABILITY PRACTICES 6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.

TOTAL HOURS: 30

OUTCOMES:

1. To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
2. To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
3. To identify and apply the understanding of renewable and non-renewable resources and
4. contribute to the sustainable measures to preserve them for future generations.
5. To recognize the different goals of sustainable development and apply them for suitable
6. technological advancement and societal development.
7. To demonstrate the knowledge of sustainability practices and identify green materials,
8. energy cycles and the role of sustainable urbanization.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

222EGT04	ENGINEERING GRAPHICS (Common to all Circuit branches)	L	T	P	C
		2	0	4	4

OBJECTIVES:

- To gain knowledge on graphical skills for drawing the object.
- To comprehend the principle of orthographic projection of points, lines and plane surfaces.
- To study the principle of simple solids.
- To comprehend the principle of section and development of solids.
- To comprehend the principle of Isometric and Orthographic projections.

Concepts and conventions (Not for Examination) 03

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

UNIT I PLANE AND SPECIAL CURVES 09

Conics – Construction of ellipse, Parabola and hyperbola by Eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 12

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

UNIT III PROJECTION OF SOLIDS 12

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

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12

Sectioning of simple solids like prisms, pyramids, cylinders and cones in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS 12

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Representation of Three-Dimensional objects – General principles of orthographic projection –Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial.
views of objects.

TOTAL HOURS : 60

COURSE OUTCOMES

The student will be able to

CO1: Recognize the conventions and apply dimensioning concepts while drafting simple objects.

CO2: Draw the orthographic projection of points, line, and plane surfaces.

CO3: Draw the orthographic projection of simple solids.

CO4: Draw the section of solid drawings and development of surfaces of the given objects.

CO5: Apply the concepts of Isometric and Orthographic projections in engineering practice.

TEXT BOOKS:

1. Ranganath G, "Engineering Graphics", Second Edition, Sahana Publishers, Reprint, 2021.
2. Bhatt. N.D., "Engineering Drawing" Charotar Publishing House, 53th Edition, 2014.

REFERENCE BOOKS:

1. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, 2017.
2. Gopalakrishnana. K. R, "Engineering Drawing" (Vol. I & II), Subhas Publications, 2014.
3. Basant Agarwal and C.M.Agarwal, "Engineering Drawing", Tata McGraw Hill, 2013.
4. Natrajan K. V, "A Text book of Engineering Graphics", Dhanalakshmi Publishers,
5. Chennai, 2012.
6. M.B.Shaw and B.C.Rana, "Engineering Drawing", Pearson Education India, 2011.

222PET05	PHYSICS FOR ELECTRONICS ENGINEERING (Common to ECE & EEE)	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

1. To make the students to understand the basics of crystallography and its importance in studying materials properties.
2. To understand the conducting properties of materials including Classical and Quantum theories.
3. To instill knowledge on physics of semiconductors.
4. To inculcate an idea of significance of modern engineering material like nano materials with its applications.
5. To insist the basic knowledge about Capacitors and Transistors.

UNIT I: PHYSICS OF CRYSTALS 6

Definitions: Crystal Structure – parameters - Bravais lattices – Calculations of no. of atoms per unit cell –atomic radius – Coordination number – packing factor of SC, BCC, FCC and HCP Structures – Miller indices - d-spacing in Cubic structure.

UNIT II: ELECTRICAL PROPERTIES OF MATERIALS 6

Conducting Materials: Classical free electron theory - Expression for electrical and thermal conductivity – Wiedmann - Franz law– drawbacks - Quantum free electron theory - Fermi-Dirac statistics - Density of energy states.

UNITIII: SEMICONDUCTING MATERIALS 6

Semiconductors – Properties - Energy band diagram – Types of semiconductors - direct and indirect band gap, Elemental and Compound semiconductors - carrier concentration in intrinsic semiconductors – Hall Effect and Devices.

UNIT IV: MODERN ENGINEERING MATERIAL 6

Nano materials: Introduction – different forms – Synthesis - ball milling - Plasma arcing method – Electro deposition- Chemical vapour deposition – application of nano phase materials.

UNIT V: ELECTROSTATICS AND TRANSISTORS 6

Capacitor – Sharing of energy between two capacitors – Capacity of spherical and cylindrical capacitors – Capacitors in series and parallel. Transistors – Working – Transistor current and parameters – input and output Characteristics of NPN transistor – Transistor as voltage amplifier and switch.

TOTAL HOURS: 30

COURSE OUTCOMES:

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

1. Know basics of crystal physics and its importance for various material properties.
2. Gain knowledge on the conducting properties of materials and their applications.
3. Understand about physics of semiconducting materials.
4. Gain knowledge about nano materials and its applications.
5. Get the basic knowledge about Capacitors and Transistors.

TEXT BOOKS:

1. R. N. Jayaprakash, Physics for information science, Sahana publication, 2022
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
3. Jasprit Singh, “Semiconductor Devices: Basic Principles”, Wiley (Indian Edition), 2007.
4. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
5. Parag K. Lala, Quantum Computing: A Beginner& Introduction, McGraw-Hill Education (Indian Edition), 2020.

REFERENCES:

1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. Y. B. Band and Y. Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
3. V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, Cambridge Univ.Press, 2008.
4. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
5. B. Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2014.

		L	T	P	C
222CAI06	**ELECTRIC CIRCUIT ANALYSIS**	**3**	**0**	**0**	**3**

UNITI BASIC CIRCUITS CONCEPTS AND ANALYSIS 9

Circuit elements, ideal sources (independent and dependent), linear passive element R, L and C; V-I relationship of circuit elements; sinusoidal voltage and current- RMS value, Average value, form factor, power and power factor; Ohm's Law – Kirchhoff's Laws; analysis of series and parallel circuits: Network reduction; voltage and current division, source transformation, star/delta transformation.

UNITII MULTI DIMENSIONAL CIRCUIT ANALYSIS & NETWEORK THEOREMS 9

Node voltage analysis of multi node circuit with current sources and Mesh-current analysis of multi node circuits with voltage sources for DC and AC circuits. Network Theorems for DC and AC circuits: Thevenin's theorem- Norton's theorem – Superposition theorem – Maximum power transfer theorem – Reciprocity theorem- compensation theorem – substitution theorem- Millman's theorem- Tellegen's theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth. Magnetically coupled circuits- Self and mutual inductance –Coefficient of coupling-Dot conversion; Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 9

Source free response of RL and RC circuits; forced (step) response of RL and RC circuits; source free response of RLC series circuit; forced (step) response of RLC series circuit; forced response of RL, RC and RLC series circuit to sinusoidal excitation; time constant and natural
frequency of oscillation of circuits. Laplace Transform application to the solution of RL, RC & RLC circuits: Initial and final value theorems and applications.

UNIT V ANALYSING THREE PHASE CIRCUITS 9

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced – phasor diagram of voltages and currents– power and power factor measurements in three phase circuits.

TOTAL HOURS:45

COURSE OUTCOMES

Upon successful completion of the course, the students should have the:

CO1 Recognize the different combinations of circuit elements and solving the circuit by applying basic circuital laws irrespective of the type of steady state source given.

CO2 Analyze electrical circuits by applying theorems.

CO3 ability to predict resonance and coupled circuits

CO4 Recall the basic concepts of Laplace transform and thus analyze the transient behavior of electrical circuits

CO5 Explain the way of generation of alternating voltage and the response of single phase circuits and three phase circuits employing balanced and unbalanced loads

REFERENCE BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",TMH publishers, 6th edition, New Delhi, 2010
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw-Hill, 2020.
3. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 2021.
4. Electric Circuit Analysis by B. Subramanian, Dreamtech Press 2020

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	P O 10	P O 11	P O 12	PSO1	PSO 2	PSO 3
CO1	2	3				2	2					1	2	3	2
CO2	2						2					1			2
CO3	2	3			2	2	1					1	3		
CO4	2	3					1					1	3		
CO5	2			3	3	2	2					1	3	3	2

	L	T	P	C
ELECTRIC CIRCUITS LABORATORY	**0**	**0**	**2**	**1**

Course Objectives

To provide exposure to the students with hands on experience on various electrical circuit laws, theorems and experiments.

LIST OF EXPERIMENTS:

1. Verification of Kirchhoff's laws and ohms laws
2. Verification of Thevenin's Theorem
3. Verification of Norton's Theorem
4. Verification of Superposition Theorem.
5. Verification of Maximum Power Transfer theorem.
6. Verification of Reciprocity theorem
7. Verification of Mesh analysis.
8. Verification of Nodal analysis.
9. Transient response of RL and RC circuits for DC input.
10. Frequency response of series and parallel resonance circuit

Total Hours :45

COURSE OUTCOMES

Upon successful completion of the course, the students should have the:

CO1 Apply basic circuital laws to confirm the practical values of the current through and voltage across different elements of the circuit with that of the theoretical values.

CO2 Apply theorems to simplify the electric circuits.

CO3 Verify the Mesh and Nodal analysis in electric circuits.

CO4 Illustrate the transient response of RLC circuits

CO5 Illustrate the frequency response of series and parallel resonance circuit

COs	**Programme Outcomes**												Programme Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3		3		2	2					1	2		2
CO2	2	3	3									1	3		
CO3		3		3		2	1						3		
CO4	2					2						1	3		
CO5	2	3	3		3		2					1		3	

222CYP08	ENGINEERING CHEMISTRY LABORATORY (Common to all Circuit Branches)	L	T	P	C
		0	0	2	1

Objectives:
Students will be conversant with the estimation of various compounds using volumetric and instrumental analysis.

LIST OF EXPERIMENTS

1. Estimation of Total hardness by EDTA
2. Determination of percentage of calcium in Lime Stone by EDTA
3. Estimation of chloride in water sample
4. Estimation of alkalinity of Water sample
5. Determination of DO in Water (Winkler's Method)
6. Determination of Rate of Corrosion of the given steel specimen by weight loss method (Without inhibitor)
7. Determination of Rate of Corrosion of the given steel specimen by weight loss method (With inhibitor)
8. Conduct metric titration (Simple acid base)
9. Conduct metric titration (Mixture of weak and strong acids)
10. Conduct metric titration using $BaCl_2$vs Na_2 SO_4
11. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
12. PH titration (acid & base)
13. Determination of water of crystallization of a crystalline salt -Copper sulphate
14. Preparation of Bio-Diesel by Trans etherification method.

A minimum of TEN experiments shall be offered. **Total Hours :45**

Course Outcomes:

CO1: Carry out the volumetric experiments and improve the analytical skills.
CO2: Understand the maintenance and usage of analytical instruments and thereby develop their skills in the field of engineering.
CO3: Understand the principle and handling of electrochemical instruments and Spectrophotometer.
CO4: Apply their knowledge for protection of different metals from corrosion by using different inhibitors

Reference(s):

1. Arthur I. Vogel's, "Quantitative Inorganic Analysis including Elementary Instrumental
   Analysis", ELBS, Group, 7th Edition, 2000.
2. Dr. K .Sivakumar, "Engineering Chemistry lab manual", S.S publishers, 2022.

222EPP09	ENGINEERING PRACTICE LABORATORY (Common to all Non-Circuit Branches)	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To get the knowledge on welding techniques and sheet metal operation.
- To know the principle involved in plumbing work and in carpentry work.
- To know about wiring various electrical joints in common household electrical and wire work.
- To know about the working procedure of electrical appliances.
- To get the knowledge about basics of electronics and to know the characteristics of switching devices.

PART –A (MECHANICAL)

LIST OF EXPERIMENTS

WELDING:

Study of Electric Arc welding equipment's.
Preparation of welding joints:
i) Butt joint ii) Lap joint iii) T - joint.

SHEET METAL WORK:

Study of sheet metal tools and operations
Preparation of sheet metal models: i) Rectangular Tray ii) Funnel

PLUMBING WORKS:

Study of pipeline joints and house hold fittings.
Preparation of plumbing models: Basic pipe connections with PVC and GI pipe fittings.

CARPENTRY:

Study of wooden joints and tools used in roofs, doors, windows, furniture.
Preparation of carpentry models:
i) Lap joint ii) Dovetail joint iii) T-Joint

PART B (ELECTRICAL AND ELECTRONICS)

LIST OF EXPERIMENTS

1. Introduction to House Wiring.
2. Staircase Wiring.
3. Fluorescent lamp Wiring.
4. Measurement of single phase energy meter.
5. Measurement of Power, Power factor by using two- wattmeter Method.
6. Study of Electrical iron box and fan with regulator.
7. Characteristics of SCR and Diode
8. Introduction to color coding of resistor.

Total Hours :45

COURSE OUTCOMES:

The students will be able to

CO1: Weld various joints in steel plates using arc welding work; Assemble simple mechanical assembly of common household equipment's; Make a tray out of metal sheet using sheet metal work.

CO2: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work

CO3: Wire various electrical joints in common household electrical wire work.

CO4: Basic knowledge about electrical appliances.

CO5: Basic knowledge about electronics devices.

322MAT01	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

- To learn various methods to solve the partial differential equations.
- To introduce Fourier series analysis which plays a vital role in many applications in engineering?
- To understand the boundary value problems and to obtain the solution using partial differential equations.
- To acquaint the Fourier transform techniques used in wide variety of situations.
- To develop z-transform techniques which analyze the discrete time signals.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Solutions of first order partial differential equations-Standard types-Singular solutions-Lagrange's Linear equation- Method of grouping and Method of multipliers-Solution of homogeneous and non-homogenous linear equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Change of scale - Odd and even functions – Half-range Sine and Cosine series – Parseval's identity applications – Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 12

Classification of Partial Differential Equations – Method of separation of Variables – Solutions of one dimensional wave equations and One-dimensional heat equations –Applications using Fourier series solutions in Cartesian coordinates - Steady state solution of two-dimensional heat equation.

UNIT IV FOURIER TRANSFORMS 12

Fourier integral theorem – Fourier transform pair - Sine and Cosine transforms – Properties – Fourier Transform of simple functions – Convolution theorem (statement and applications only) – Parseval's identity (statement and applications only).

UNIT V Z – TRANSFORMS 12

Z-Transform - Elementary properties and applications – Initial and final value theorems (statement and applications only) - Inverse Z-Transform – Partial fractions method, Residue theorem method and Convolution theorem (statement and applications only) - Solution of difference equations by applying Z-transforms.

TOTAL HOURS: 60

COURSE OUTCOMES

At the end of the course the student will have

CO1 Know the methods to solve partial differential equations occurring in various physical and engineering problems.

CO2 Describe an oscillating function which appears in a variety of physical problems by Fourier series which helps them to understand its basic nature deeply.

CO3 Acquire the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.

CO4 Apply the Fourier transform techniques in engineering field.

CO5 Gain the concept of analysis of linear discrete system using Z-transform approach

TEXT BOOKS

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 44th edition, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition Wiley India, 2016.

REFERENCE BOOKS

1. Andrews L.C and Shivamoggi. B.K., "Integral Transforms for Engineers", SPIE Press Book, 1999
2. Wylie C R and Barrett L C, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Co., New Delhi, 1995
3. T.Veerarajan,"Engineering Mathematics-III", Tata McGraw-Hill Publishing company, New Delhi,2015
4. P.Kandasamy, K.Thilagavathy, K.Gunavathy, " Engineering Mathematics-III", S.Chand Publishers,2015.
5. V.Prameelakaladharan and G.Balaji ,"Engineering Mathematics-III", Amrutha marketing, Chennai,2016.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2									2	2	2	
CO2	3	3	2									2	2	2	
CO3	3	3	3									2	2	2	
CO4	3	2	2									2	2	2	
CO5	3	2	2									2	2	2	

322EET02	ELECTRO MAGNETIC THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce the basic mathematical concepts related to electromagnetic fields.
- To understand the concepts of Electrostatics.
- To understand the concepts of Magneto statics.
- To understand the concept of Electromagnetic Fields.
- To understand the concepts of waves and wave propagation.

UNIT I INTRODUCTION 9

Introduction: Co-ordinate systems and transformation, Cartesian co-ordinates, Circular cylindrical co-ordinates, Spherical coordinates and their transformation-Differential length, area, and volume in different coordinate systems-Numerical problems.

Vector calculus: DEL operator-Gradient of a scalar-Divergence of a vector-Divergence theorem- Curl of a vector-Stokes Theorem-Classification of vector fields-Numerical problems.

UNIT II ELECTROSTATIC FIELD 9

Coulomb's law-field intensity-Gauss's law and applications-Electric potential and Potential Gradient-Relation between E and V-Electric dipole and flux lines - Energy density in electrostatic field – Capacitance - Boundary conditions - Poisson's and Laplace's equations - Numerical problems.

UNIT III MAGNETO STATIC FIELDS 9

Biot- savart law - Ampere's circuital law - Magnetic flux density - Magneto static and Vector potential – Forces due to magnetic field - Magnetic torque - Magnetic materials - Magnetic boundary conditions- Inductor and Inductances - Magnetic energy density - Numerical problems.

UNIT IV ELECTRO MAGNETIC FIELDS 9

Transformer and motional Emf -Displacement current - Maxwell's equations (differential and integral form) - Relation between field theory and circuit theory - Introduction to field computation methods-FDM, FEM, MoM.

UNIT V ELECTROMAGNETIC WAVE PROPAGATION 9

Wave equations for conducting and non-conducting media - Wave equations in Phasor form –Uniform plane waves in perfect dielectrics, conductors, and free space - Skin effect- Introduction to EM Shielding - Case Study: Biological Effects of Electromagnetic Waves.

TOTAL HOURS:45

COURSE OUTCOMES

At the end of the course the student will have

CO1 Learnt mathematical operations of three-dimensional vectors related to electromagnetic fields

CO2 Gained the acquaintance in applications of Poisson's and Laplace's equations

CO3 Acquired the knowledge in applications of Biot-Savart's Law and Ampere's Circuital law.

CO4 Gained the indulgent of the Maxwell's equations and its applications.

CO5 Attained the knowledge in principles of propagation of plane waves.

TEXT BOOKS

1. Mathew N.O. Sadiku ,Elements of Electromagnetics, 7th edition, Oxford University Press.2018.
2. William.H. Hayt , J.A. Buck & M Jaleel Akhtar, Engineering Electromagnetics, 9th Edition, McGraw Hill Education (India) Private Limited, 2020.
3. Joseph A. Edminister, Schaum's outline of Electromagnetics, 2nd Edition, McGraw Hill Education, 2017.
4. Bhag Singh Guru, Hüseyin R. Hiziroglu, Electromagnetic Field Theory Fundamentals, 2nd Edition, Cambridge University Press, 2004.

REFERENCE BOOKS

1. John D. Kraus, Kraus, Daniel A. Fleisch, Electromagnetics with application, 5th Edition, McGraw Hill Education, 2017.
2. N.N. Rao, Fundamentals of Electromagnetics for Electrical and Computer Engineering, 6th Edition, Pearson Prentice Hall, 2009.
3. K. A. Gangadhar and P. M. Ramanathan, 'Electromagnetic Field Theory', 16TH Edition Reprint, KhannaPublishers, Delhi, 2009.
4. Sedki M. Riad, Iman M. Salama, 'Electromagnetic Fields & Waves: Fundamentals Of Engineering', 1st Edition, McGraw Hill, 2020.

COs	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	3	3											3		3
CO2	3	3			3	3							2	3	
CO3	3	3			3								2		2
CO4	3	3				3							3		
CO5	3	2			2								3	3	3

322EET03	ENERGY STORAGE SYSTEMS	L	T	P	C
		3	0	0	2

Prerequisite: NIL

Objectives:

To Understand the various types of energy storage Technologies.
To Learn the thermal storage system.
To Understand the different battery storage technologies
To Understand the thermodynamics of Fuel Cell
To Understand various applications of energy storage systems.

UNIT – I INTRODUCTION 9

Necessity of Energy Storage – Types of Energy Storage – Thermal Energy, Mechanical Energy, Chemical Energy, Electrochemical Energy, Solar Energy Storage- Comparison of Energy Storage Technologies – Applications.

UNIT - II THERMAL STORAGE SYSTEM 9

Thermal storage – Types – Modeling of thermal storage units – Simple water and rock bed storage system – pressurized water storage system – Modelling of phase change storage system –Simple units, packed bed storage units - Modelling using porous medium approach

UNIT - III ELECTRICAL ENERGY STORAG SYSTEM 9

Fundamental concept of batteries – measuring of battery performance, charging and discharging, power density, energy density, and safety issues. Types of batteries – Lead Acid, Nickel –Cadmium, Zinc Manganese dioxide, Li-ion batteries - Mathematical Modeling for Lead Acid Batteries – Flow Batteries.

UNIT - IV FUEL CELLS 9

Fuel Cell – History of Fuel cell, Principles of Electrochemical storage – Types – Hydrogen oxygen cells, Hydrogen air cell, Hydrocarbon air cell, alkaline fuel cell, – Advantages and Disadvantages-Applications

UNIT - V ALTERNATE ENERGY STORAGE TECHNOLOGIES 9

Flywheel, Super capacitors, Principles & Methods – Compressed air Energy storage, Concept of Hybrid Storage – Pumped Hydro Storage – Applications.

Total Hours : 45

COURSE OUTCOMES:

CO1	Learn the different types of energy storage technologies
CO2	Attained the knowledge about thermal storage system
CO3	Acquired the knowledge in battery storage system
CO4	Ability to understand the various types of fuel cells
CO5	Ability to understand the alternate energy storage technologies.

TEXT BOOKS:

1. Ibrahim Dincer and Mark A. Rosen, 'Thermal Energy Storage Systems and Applications', John Wiley & Sons, 3rd Edition, 2021.

2. Ru-shi Liu, Lei Zhang and Xueliang sun, 'Electrochemical technologies for energy storage and conversion', Wiley publications, 2nd Volume set, 2012.

3. James Larminie and Andrew Dicks, 'Fuel cell systems Explained', Wiley publications, 3rdEdition, 2018.

REFERENCES

1. Lunardini.V.J, 'Heat Transfer in Cold Climates', John Wiley and Sons 1981,1stEdition.

2. Schmidt.F.W. and Willmott.A.J., 'Thermal Energy Storage and Regeneration', Hemisphere Publishing Corporation, 1981, 1st Edition.

	Programme Outcomes												**Programme Specific Outcomes**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**1**											**2**		**3**
CO2	**3**		**2**										**2**		**3**
CO3	**3**		**2**										**2**		**3**
CO4	**3**		**2**										**2**		**3**
CO5		**3**				**2**		**1**					**2**		**3**

322EET04	ELECTRON DEVICES AND CIRCUITS	L	T	P	C
		3	0	0	3

Objectives:

- To Understand the structure of basic electronics devices
- To Familiarize the operation and characteristics of transistor like BJT and MOSFET
- To Explore the design and analysis of amplifiers and understand the frequency response of amplifier.
- To Learn the required functionality of positive and negative feedback amplifier
- To know the design and applications of Oscillators

UNIT – I DIODE AND IT'S APPLICATIONS **9**

PN Junction Diode-Structure-Operation-VI characteristics, Half wave rectifier, Full wave rectifier-Impact of filters-Zener diode –Breakdown characteristics –Voltage regulation – Varactor diode –Light emitting diode (LED)-Photo diode-Schottky diode- Design of Active Filters-Applications.

UNIT - II TRANSISTORS AND THYRISTORS **9**

Transistors –BJT, UJT, FET, MOSFET-Structure-Operation-Input-output characteristics – Biasing methods of BJT, FET & MOSFET, Thyristors-Structure- Operation-VI characteristics- Applications.

UNIT - III SMALL SIGNAL AND LARGE SIGNAL AMPLIFIERS **9**

BJT-Configurations –Small signal analysis using hybrid model-Analysis of CE amplifier-Frequency response-MOSFET- Configurations –Small signal models- Analysis of CS and Source follower amplifiers –Power amplifiers –Class A, B, AB, C and D amplifiers (Qualitative analysis only)

UNIT - IV MULTI STAGE AND DIFFERENTIAL AMPLIFIERS **9**

Introduction to Multistage Amplifiers, Different coupling methods and their frequency response – Darlington connection-Differential Amplifier –Common mode analysis-Differential mode analysis, CMRR, Single tuned and double tuned amplifiers

UNIT - V FEED BACK AMPLIFIERS AND OSCILLATORS **9**

Feedback Amplifiers –Types –Stability –Distortion-Negative Feedback-Voltage/Current-Series/Shunt feedback amplifiers –Positive feedback-Barkhausen Criterion –Operation of RC phase shift, Hartely, Crystal oscillators – Astable, Monostable and bistable Multivibrators

Total Hours : 45

Course Outcomes:

CO1	Understand the operation, characteristics and applications of diodes
CO2	Understand the operation, characteristics and applications of transistors
CO3	Design and analyze BJT and MOSFET amplifiers through frequency response
CO4	Design and analyze multistage and differential amplifiers through frequency response
CO5	Known feedback circuits for amplifier and describe various oscillators and its Stability

TEXT BOOKS:

1. Floyd T.L "Electronic Devices ", Pearson Education,9th Edition,2012
2. S. Salivahanan, N. Suresh Kumar "Electronic Devices and Circuits",Mc graw Hill Education , New Delhi , Fourth Edition ,2016
3. David A. Bell "Electronic Devices and Circuits "Oxford ,7 th Edition ,2008

REFERENCES

1. J.Milliman ,C.C ,Halkias and Satyabratajit" Electronic Devices and Circuits"TMH Second Edition ,1998
2. B.P Singh , Rekha Singh," Electronic Devices and Circuits „Pearson ,Second Edition,2013
3. Robert L.Boylestad , Louis Nashelsky" Electronic Devices and Circuits Theory„Pearson ,Fourth Edition,1987
4. Mohammad Rashid," Electronic Devices and Circuits "Cengage Learning ,2013

	Programme Outcomes												**Programme Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**		**3**		**3**			**2**					**1**	**3**	**-**
CO2	**3**												**1**	**3**	**-**
CO3	**3**	**2**	**3**	**2**	**2**	**3**		**2**					**1**	**3**	**-**
CO4	**3**			**2**					**2**			**1**	**1**	**3**	**-**
CO5	**3**			**2**	**2**	**2**							**1**	**3**	**2**

322EEI05	MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	4

Objectives:

To educate the fundamental concepts and characteristics of measurement and errors
To impart the knowledge on the functional aspects of measuring instruments
To infer the importance of various bridge circuits used with measuring instruments.
To educate the fundamental working of sensors and transducers and their applications
To summarize the overall measurement and instrumentation with the knowledge on digital instrumentation principles.

UNIT – I CONCEPTS OF MEASUREMENTS 9

Functional elements of an instrument, Performance characteristics of instruments -Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration

UNIT - II MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS 9

PMMC instruments-MI instruments- – Single and three phase wattmeter's and Energy meter – Megger-Magnetic measurements – Instrument transformers.

UNIT - III AC/DC BRIDGES AND POTENTIO METERS 9

Types of D.C bridges: Wheatstone Bridge-Kelvin Bridge- Types of A.C bridges: Maxwell, Schering and Anderson Bridge-Types of D.C potentio meters: Laboratory type, Duo-range, Vernier and Deflection-Types of A.C potentio meters: Polar, co-ordinate Potentiometers-Instrumentation Amplifiers.

UNIT - IV TRANSDUCERS FOR MEASUREMENT OF NON- ELECTRICAL PARAMETERS 9

Classification of transducers – Measurement of pressure, temperature, displacement, flow, angular velocity – Digital transducers – Smart Sensors.

UNIT - V DIGITAL INSTRUMENTATION 9

A/D converters: types and characteristics – Measurement of voltage, Current, frequency and phase - D/A converters: types and characteristics- DSO- Data Loggers – Basics of PLC programming and Introduction to Virtual Instrumentation - Instrument standards.

Total Hours : 45

Course Outcomes:

CO1 Ability to understand the fundamental art of measurement in engineering.

CO2 Ability to understand the structural elements of various instruments.

CO3 Ability to understand the importance of bridge circuits.

CO4 Ability to understand about various transducers and their characteristics by experiments.

CO5 Ability to understand the concept of digital instrumentation and virtual instrumentation by experiments.

TEXT BOOKS:

1. E. O. Doebelin and D. N. Manik, "Measurement Systems – Application and Design", Tata McGraw-Hill, New Delhi, 6th Edition 2017.
2. A.K. Sawhney, Puneet Sawhney A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, Edition 2011.
3. H.S. Kalsi, „Electronic Instrumentation", Tata McGraw-Hill, New Delhi, 2012

REFERENCES

1. M.M.S. Anand, „Electronics Instruments and Instrumentation Technology", Prentice Hall India,

   New Delhi, 2009
2. J.J. Carr, „Elements of Electronic Instrumentation and Measurement", Pearson Education India,

   New Delhi, 2011
3. W. Bolton, Programmable Logic Controllers, 6th Edition, Elseiver, 2015.
4. R.B. Northrop, „Introduction to Instrumentation and Measurements", Taylor & Francis, New Delhi,3rd Edition 2014.
5. E. O. Doebelin and D. N. Manik, "Measurement Systems – Application and Design", Tata

   McGraw-Hill, New Delhi, 6th Edition 2017.
6. 6. R. K. Rajput, "Electrical and Electronics Measurements and Instrumentation", Chand Pub, 2016

	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	3		3	2		2				3	3	3	3
CO2	3	2	3	2						3		3	3	3	3
CO3	3	2	3		3	2						3	3	3	3
CO4	3	2	3					2					3	3	3
CO5	3	2	3	2	3					3		3	3	3	3

322EEI05	MEASUREMENTS AND INSTRUMENTATION LAB	L	T	P	C
		0	0	2	1

Objectives:

1. To train the students in the measurement of resistance, inductance and capacitance
2. To train the students in the measurement of resistance by megger
3. To measure the Voltage by potentio meters
4. To give exposure to A/D and D/A converters.
5. To measure the displacement by LVDT

LIST OF EXPERIMENTS

1	Measurement of inductance by using Maxwell bridge
2	Measurement of inductance by using Anderson bridge
3	Measurement of capacitance by using Schering bridge
4	Measurement of resistance using Wheatstone bridge
5	Measurement of resistance using Kelvin double bridge
6	Measurement of resistance using Megger
7	D.C and A.C potentio meters
8	Instrumentation amplifier
9	Analog to Digital converter
10	Digital to Analog converter
11	Characteristics of LVDT

Total Hours : 45

322CST04	C PROGRAMMING & DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Familiarize the basic programming concepts in C.
- Solve real time problems using functions, structure and union.
- Impart the basic concepts of linear data structures.
- Solve problem using nonlinear data structures.
- Identity the various Sorting, Searching and hashing algorithms.

UNIT I C PROGRAMMING BASICS 9

Structure of a C program - compilation and linking processes - Constants, Variables –Data types - Expressions using operators in C - Managing Input and Output operations - Decision Making and Branching - Looping statements. Arrays - Initialization - Declaration - One dimensional and Two-dimensional arrays. Strings - String operations - String Arrays.

UNIT II FUNCTIONS, POINTERS, STRUCTURES AND UNIONS 9

Functions - Pass by value - Pass by reference - Recursion - Pointers - Initialization - Pointers arithmetic. Structures and unions - Structure within a structure - Union - Files- Operations on Files- Memory Management.

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UNIT III LINEAR DATA STRUCTURES 9

Abstract Data Types - Linked list Implementation of List- polynomial addition- Linked List Implementation of Stack- Balancing Symbols - Postfix Expressions - Infix to Postfix Conversion - Linked list Implementation of Queues- Circular Queue.

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UNIT IV NON LINEAR DATA STRUCTURES 9

Preliminaries -Binary Trees -Tree Traversals - Binary Search Tree -Operations on Binary Search Tree - Heaps - Binary Heaps - Operations of Heaps - Graph and its representations - Graph Traversals -Shortest Path Algorithm: Dijkstra’s Algorithm- Minimum Spanning Tree: Prim’s Algorithm – Kruskal’s Algorithm.

UNIT V SEARCHING, SORTING AND HASHING 9

Linear Search - Binary Search -Bubble Sort - Insertion Sort - Quick Sort - Merge Sort - Hash Functions - Separate Chaining -Open Addressing.

TOTAL HOURS : 45

COURSE OUTCOMES:

CO 1 Summarize the basic concepts of C

CO 2 Develop programs for real-time application using functions, structures, union

CO 3 Gain knowledge on operations of linear data structures

CO 4 Develop applications using nonlinear data structures

CO 5 Apply appropriate sorting, searching technique for given problem

TEXT BOOKS:

1. 1.ReemaThareja, "Programming in C", Second Edition, Oxford University Press, 2016
2. Ashok.N. Kamthane, - "Computer Programming", Pearson Education, Second edition(India), 2012
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education,1997

REFERENCES:

1. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.
2. PradipDey and Manas Ghosh, ―Programming in C, Second Edition, Oxford University Press, 2011.
3. E. Balagurusamy, - "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, 2008
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C, Second Edition, University Press, 2008

	Programme Outcomes												**Programme Specific Outcomes**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**													
CO2	**2**	**3**	**3**										**3**		
CO3	**2**	**3**	**3**										**3**	**2**	
CO4	**2**	**3**	**3**										**3**	**2**	**1**
CO5					**3**								**2**		**2**

		L	T	P	C
322EEP07	**ELECTRON DEVICES AND CIRCUITS LABORATORY**	**0**	**0**	**2**	**1**

Course Objectives

To enable the students to understand the behavior of semiconductor device based on experimentation.

LIST OF EXPERIMENTS:

1. Single phase half wave rectifier with and without filters.
2. Single phase full wave rectifier with and without filters.
3. Characteristics of Zener Diode
4. Characteristics of photo diode.
5. Characteristics of Transistor under Common Base Configurations.
6. Characteristics of Transistor under Common Emitter Configurations.
7. Characteristics of JFET and draw the equipment circuit.
8. Characteristics of UJT and generation of saw tooth waveforms.
9. Characteristics of Class A Amplifier.
10. Frequency response of Differential Amplifier
11 RC phase shift oscillator and Astable multivibrators.

TOTAL HOURS :45

COURSE OUTCOMES

Upon successful completion of the course, the students should have the:

CO1 Characterize of rectifier and Zener Diode
CO2 Characteristics of Transistor
CO3 frequency response of amplifiers
CO4 Frequency response of Differential Amplifier
CO5 Characterize of RC phase shift and LC oscillators.

	Programme Outcomes												**Programme Specific Outcomes**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	**3**			**3**			**2**					**1**	**3**	**-**
CO2	**2**	**3**	**3**										**1**	**3**	**-**
CO3		**3**	**3**	**2**	**2**	**3**		**2**						**3**	**-**
CO4	**2**			**2**					**2**			**1**	**1**	**3**	**-**
CO5	**2**	**3**		**2**	**2**	**2**							**1**	**3**	**2**

322CSP07	C PROGRAMMING & DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES: Nil

- Understand and implement basic data structures using C.
- Understand functions & recursive functions in C.
- Apply linear and non-linear data structures in problem solving.
- Learn to implement functions and recursive functions by means of data structures.
- Implement searching and sorting algorithms.

PRE REQUISITE: Nil

LIST OF EXERCISES :

1. Basic C Programs – Looping, Decision- Making
2. Programming using Arrays and String functions
3. Programming using Functions and Recursion
4. Programs using Structures and Union
5. Program using Pointers
6. Program using Memory Management Functions
7. Linked list implementation of List, Stacks and Queues
8. Implementation of Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Graph Traversals
11. Implementation of Shortest Path Algorithm
12. Implementation of Linear search and binary search
13. Implementation of Insertion sort, Quick sort and Merge Sort

TOTAL HOURS: 45

COURSE OUTCOMES:

CO 1	Implement basic and advanced programs in C
CO 2	Implement functions and recursive functions in C
CO 3	Apply the different Linear Data Structures for Implementing Solutions to Practical Problems
CO 4	Apply and implement Graph Data Structures for Real Time Applications
CO 5	Implement various Searching, Sorting and hashing Algorithms

	Programme Outcomes												Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3												2	3	
CO2	3	2	3				2		3			2	2		2
CO3	3	2	2				3		2			3	3	3	2
CO4	2	3							2						
CO5	2												2	1	

		L	T	P	C
322GEV09	**PROFESSIONAL DEVELOPMENT**	**0**	**0**	**2**	**1**

OBJECTIVES:

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

MS WORD: 15 HOURS

1. Create and format a document
2. Working with tables
3. Working with Bullets and Lists
4. Working with styles, shapes, smart art, charts
5. Inserting objects, charts and importing objects from other office tools
6. Creating and Using document templates
7. Inserting equations, symbols and special characters
8. Working with Table of contents and References, citations
9. Insert and review comments
10. Create bookmarks, hyperlinks, endnotes footnote
11. Viewing document in different modes
12. Working with document protection and security
13. Inspect document for accessibility

MS EXCEL: 15 HOURS

1. Create worksheets, insert and format data
2. Work with different types of data: text, currency, date, numeric etc.
3. Split, validate, consolidate, Convert data
4. Sort and filter data
5. Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
6. Work with Lookup and reference formulae
7. Create and Work with different types of charts
8. Use pivot tables to summarize and analyse data
9. Perform data analysis using own formulae and functions

10. Combine data from multiple worksheets using own formulae and built-in functions to generate results
11. Export data and sheets to other file formats
12. Working with macros
13. Protecting data and Securing the workbook

MS POWERPOINT: 15 HOURS

1. Select slide templates, layout and themes
2. Formatting slide content and using bullets and numbering
3. Insert and format images, smart art, tables, charts
4. Using Slide master, notes and handout master
5. Working with animation and transitions
6. Organize and Group slides
7. Import or create and use media objects: audio, video, animation
8. Perform slideshow recording and Record narration and create presentable videos

TOTAL HOURS : 45

COURSE OUTCOMES:

The students will be able to

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

422NMT01	NUMERICAL METHODS (Common to AERO, CHEM, CIVIL, EEE & MECH)	L	T	P	C
		3	1	0	4

Course Objectives

- To solve equations using direct and iterative methods.
- To introduce interpolation techniques to determine the intermediate values of a function from a given set of values in ordered pairs.
- To study the principle of numerical differentiation and integration using interpolation.
- To learn some of the methods of numerical solutions of ordinary differential equations with initial conditions.
- To determine the solutions of boundary value problems using numerical iterative processes

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss Elimination method - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Eigenvalues of a matrix by Power method.

UNIT II INTERPOLATION AND APPROXIMATION 9 + 3

Interpolation with equal intervals - Newton's forward and backward difference formulae - Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 9 + 3

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9 + 3

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 45 + 15 = 60 PERIODS

Course Outcomes: At the end of the course the student will be able to

CO 1: Apply numerical methods such as direct and iterative methods to solve Algebraic or Transcendental equations and system of equations.

CO 2: Use the concept of interpolation and apply to real life situations.

CO 3: Find numerical solutions for derivatives and integrals.

CO 4: Implement numerical algorithms to solve the Initial value problems for ordinary differential equations.

CO 5: Demonstrate algorithms using finite differences to obtain solutions to boundary value problems in ODE and partial differential equations.

TEXT BOOKS

1. Kandasamy.P, Thilagavathy,K. & Gunavathi.K., "Numerical Methods"., S.Chand & Company Ltd., New Delhi, 2014.

2. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2012.

REFERENCES

1. Richard L.Burden and J.Dougles Faires, "Numerical Analysis", Ninth Edition, BROOKS/COLE, Cengage.com.,2012, visit www.cengage.com/international.

2. S.S.Sastry, "Introductory Methods of Numerical Analysis", 5th Edition, Prentice Hall of India Private Ltd., New Delhi, 2012.

3. Sankara Rao, K. "Numerical methods for Scientists and Engineers', 2nd Edition Prentice Hall of India Private Ltd., New Delhi, 2005.

4. Ward Cheney and David Kincaid, "Numerical Mathematics and Computing", Brooks/Cole Publishing company, Fourth Edition, 1999.

5. Jain M K, Iyengar S R K and Jain R K, "Numerical methods for Scientific and Engineering Computation", 6th edition, New Age International (P) Ltd, 2012.

CO-PO MAPPING															
SEMESTER : IV		Course Name : **422NMT01 - NUMERICAL METHODS**													
CO'S	**Course Outcomes**	**Program Outcomes (PO)**											**Program Specific Outcomes (PSO)**		
		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
CO 1	Apply numerical methods such as direct and iterative methods to solve algebraic or transcendental equations and system of equations.	3	2	1	1	1							2	2	2	
CO 2	Use the concept of interpolation and apply to real life situations.	3	3	2	2	1							2	2	2	
CO 3	Find numerical solutions for derivatives and integrals.	3	3	3	2	2							2	2	2	
CO 4	Implement numerical algorithms to solve the intial value problems for ordinary differential equations.	3	2	1	1	1							2	2	2	
CO 5	Demonstrate algorithms using finite differences to obtain solutions to boundary value problems in ODE and partial differential equations.	3	2	2	2	2							2	2	2	

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

422EEI02	Control Systems	L	T	P	C
		3	0	0	4

Prerequisite: **Electric Circuit Analysis**

COURSE OBJECTIVES

- To identify the transfer function of electrical and mechanical systems.
- To determine the time-domain response of first and second order systems.
- To examine the stability of open loop system by using bode / polar plot.
- To analyze the stability of the system by Root locus, Nyquist stability and Routh Hurwitz criterion.
- To inspect the State space representation, Controllability and Observability

UNIT I CONTROL SYSTEM MODELING 12

Basic Elements of Control System - Open loop and Closed loop systems –Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Electrical Analogous of Mechanical Systems -Block diagram- Signal flow graph.

UNIT II TIME RESPONSE ANALYSIS 12

Time response analysis – Test Signals - First Order Systems - Impulse and Step Response analysis of second order systems – Time Domain Specifications-Steady state errors - P, PI, PDand PID controllers.

UNIT III FREQUENCY RESPONSE ANALYSIS 12

Frequency Domain specifications -Bode Plot, Polar Plot, Nyquist Plot- Lead, Lag, and Lead Lag Compensators, Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY ANALYSIS 12

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability

UNIT V STATE VARIABLE ANALYSIS 12

State space representation of Continuous Time systems - Transfer function from State Variable Representation - Eigen values – Eigen Vectors-Solutions of the state equations - State transition matrix - Concepts of Controllability and Observability.

TOTAL:60 PERIODS

COURSE OUTCOMES

The student will be able to

CO1 Develop the transfer function for different mechanical and electrical systems.

CO2 Categorize the time domain specifications and steady state error constants.

CO3 Analyze the systems in frequency domain using different plots, compensators.

CO4 Analyze the systems stability using different criterion.

CO5 Simplify the system in state space model analyze the controllability & observability.

TEXT BOOKS

1. Nagrath I J and Gopal M, "Control System Engineering ", New Age International Pvt Ltd., Sixth Edition, 2017.
2. Ogata K, "Modern Control Engineering", Prentice-Hall of India Pvt Ltd., NewDelhi, 2010.

REFERENCE BOOKS

1. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004.
4. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, Fifth Edition,2004.
5. NPTEL courses web: http://nptel.ac.in/courses/108106068.

COs	**Programme Outcomes**												**Programme Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3			1				2	3	3	3
CO2	3	3	3	3	3			1				2	3	3	3
CO3	3	3	3	3	3			1				2	3	3	3
CO4	3	3	3	3	3			1				2	3	3	3
CO5	3	3	3	3	3			1				2	3	3	3

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

CONTROL SYSTEMS LABORATORY

LIST OF EXERCISES

1. Transfer function of self-excited DC Generator
2. Transfer function of Armature controlled DC Motor
3. DC and AC position control systems
4. Design of Lag network
5. Design of Lead network
6. Design of Lag-Lead network
7. Simulation of first order & second order system using MATLAB

COs	**Programme Outcomes**												**Programme Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3			1				2	3	3	3
CO2	3	3	3	3	3			1				2	3	3	3
CO3	3	3	3	3	3			1				2	3	3	3
CO4	3	3	3	3	3			1				2	3	3	3
CO5	3	3	3	3	3			1				2	3	3	3

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

422EET03	Transmission and Distribution	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To impart knowledge about the configuration of the electrical power systems and study the line parameters
- To analysis the performance of transmission lines.
- To understand the mechanical design and learn different types of insulators.
- To learn different types of underground cables
- To understand substation and distribution system

UNIT – I TRANSMISSION LINE PARAMETERS 9

Structure of electric power system-Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance– stranded and bundled conductors – symmetrical and unsymmetrical spacing – Transposition of conductors – self and mutual GMD – Skin and Proximity effect.

UNIT – II PERFORMANCE OF TRANSMISSION LINES 9

Classification of lines: Short line, medium line and long line; Equivalent circuits, Attenuation constant, phase constant, surge impedance; Transmission Efficiency and Voltage Regulation- Ferranti effect – Formation of Corona – Critical Voltages- Factors Affecting corona loss – Advantages and Disadvantages of Corona-Methods of reducing corona effect.

UNIT – III SAG CALCULATION AND INSULATORS 9

Sag and Tension – Calculation of Tension and Sag for different weather conditions- Line Supports –Types of towers-Insulators - Properties of insulators -Types, voltage distribution in insulator string, grading- Calculating string efficiency -improvement of string efficiency.

UNIT IV UNDERGROUND CABLES 9

Underground cables: - Construction of single-core and 3-core belted cables - Types of cables -Advantages of Underground Cables-Insulation Resistance of a cable – Capacitance of a single core and three core cables – Grading of Cables – Capacitance and intersheath grading- DC cables-Underground water cables.

UNIT V DISTRIBUTION SYSTEMS AND SUBSTATION 9

Distribution Systems – AC and DC distributions –Concentrated and Distributed loading-Techniques of Voltage Control -Advantages and Disadvantage of AC and DC distribution-Classification of Substations- Equipment for substation -Comparison between indoor and outdoor substation- Trends in Transmission and Distribution: HVAC, HVDC and FACTS - TCSC, SVC, STATCOM, UPFC (Qualitative treatment).

TOTAL:45 PERIODS

COURSE OUTCOMES

The student will be able to

CO1 Compute the transmission line parameters for different configurations.

CO2 Determine the transmission line performance.

CO3 Illustrate Mechanical design of transmission lines.

CO4 Describe about the underground cable in transmission system.

CO5 Examine the modern trends in distribution system

TEXT BOOKS

1. C.L.Wadhwa, 'Electrical Power Systems', New Age International Ltd, Eighth edition 2022.
2. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Mc Graw-Hill Publishing Company limited, New Delhi, Third Edition, 2019.
3. V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi, 4th Edition,

REFERENCE BOOKS

1. B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Sixth Edition, 2011.
2. Arun Ingole, "Power transmission and distribution" Pearson Education, first edition, 2018
3. Luces M.Fualken berry, Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 2007
4. Despande.M.V, "Electrical Power Systems Design" , Tata McGraw Hill Publishing Company,New Delhi, 26thReprint, 2009.
5. R.K.Rajput, 'A Text Book of Power System Engineering' 2nd edition, Laxmi Publications (P) Ltd, New Delhi, 2016
6. Stevenson.W.L., "Elements of Power System Analysis", McGraw Hill, New Delhi, 4th Edition, 2014.

	Programme Outcomes												**Programme Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3		2								2		
CO2	3	2	2		2								3		
CO3	3	2	2		2								3	2	
CO4	3	2	2		2								3	2	
CO5	3	2	2		2								3		

1: Slight (Low) 2:Moderate (Medium) 3: Substantial (High)

422EET04	Linear Integrated Circuits and Applications	L	T	P	C
		3	0	0	3

Prerequisite: Basic knowledge in Electron Devices and Circuits is required

COURSE OBJECTIVES

- To know the IC fabrication procedures.
- To familiarize with the characteristics and basic circuits of Op-amp ICs.
- To understand the applications of Op-amp.
- To study functional blocks and the applications of special ICs like Timers,PLL circuits.
- To learn about the Application ICs like regulator IC.

UNIT I IC FABRICATION 9

Fundamentals of Integrated Circuits, IC classifications, fundamentals of monolithic IC technology, Basic Planar Processes, Realization of monolithic ICs and packaging. Fabrication of diodes, transistor and FETs.

UNIT II CHARACTERISTICS OF OP AMP 9

OP-AMP -block diagram, Ideal OP-AMP characteristics, virtual ground concept, differential amplifiers, DC characteristics, AC characteristics; frequency response of OP-AMP circuits; summer, Subtractor, differentiator and integrator.

UNIT III APPLICATIONS OF OP AMP 9

Precision rectifier, half wave and full wave rectifiers, clippers, clampers, peak detectors, Instrumentation amplifier, V/I and I/V converters, S/H circuit, comparators, monostable and astable multivibrators, sine and triangular wave generators, first-and second-order active filters, log and antilog amplifier.

UNIT IV SPECIAL ICs 9

555 Timer Functional block diagram and description – Monostable and Astable operation, Applications, 566 Voltage Controlled Oscillator, 565 PLL Functional Block diagram – Principle of operation, Building blocks of PLL, Characteristics, Applications of PLL: Frequency synthesis, AM and FM detection, FSK demodulator.

UNIT V APPLICATION ICs 9

IC voltage regulators – 78xx, 79xx, LM317, 723 regulators, switching regulator: SMPS,78S40-8038 function generator IC- AD623 Instrumentation Amplifier IC – applications.

TOTAL:45 PERIODS

COURSE OUTCOMES

The student will be able to

CO1 Describe the fabrication steps of ICs.

CO2 Illustrate the characteristics of operational amplifier.

CO3 Design the basic application circuits of operational amplifier.

CO4 Design multivibrator circuits using the Timer IC.

CO5 Describe the functional blocks of various application ICs.

TEXT BOOKS

1. Ramakant A. Gayakward, ‘Op-amps and Linear Integrated Circuits’, IV edition, Pearson Education, 2021
2. D.Roy Choudhary, Sheil B.Jain, ‘Linear Integrated Circuits’, Fourth edition, New Age, 2018

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuitssystem', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997.
4. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, Fifth Edition,2004.
5. NPTEL courses web: http://nptel.ac.in/courses/108106068.

COs	**Programme Outcomes**												**Programme Specific Outcomes**		
	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2											2		
CO2	3	2	2				2						2		
CO3	3	3	2				3						3	3	2
CO4	3	3	2				3						3	3	2
CO5	2	2					2						2		

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

422EET05	DC Machines and Transformers	L	T	P	C
		3	0	0	3

Prerequisite: Basic knowledge in Electromagnetic Theory is required

COURSE OBJECTIVES

- To understand the concept of electromechanical energy conversion system.
- To illustrate the working principle of operation of D.C. Generator and their performance characteristics.
- To identify the appropriate test to determine the performance parameters of a given DC Motor.
- To familiarize the operation of single phase transformer and their performance.
- To deliberate the working of auto transformer and three phase transformers.

UNIT I ELECTROMECHANICAL ENERGY CONVERSION 9

Fundamentals of magnetic circuits- statically and dynamically induced EMF - principle of energy conversion -energy in magnetic systems- co-energy in singly excited system - multiple excited system –generated EMF-MMF of distributed windings: MMF space wave of single coil –magnetic fields in rotating machines.

UNIT II DC GENERATORS 9

Constructional details - Principle of operation – Types of generators-EMF equation- - armature reaction-demagnetizing and cross magnetizing Ampere turns-commutation–inter poles-compensating windings- -OCC and load characteristics -losses –Applications.

UNIT III DC MOTORS 9

Principle of operation – back EMF- torque equation- Lenz's law- - types of DC motors - speed control of DC shunt motor - Ward-Leonard control system- starting methods of DC motors- load characteristics of DC motors-losses -efficiency- testing of DC machines: brake test-Swinburne's test-Hopkinson's test-Separation of core losses-Applications.

UNIT IV SINGLE PHASE TRANSFORMERS 9

Constructional details-Principle of operation-Classification of Transformers-Ideal transformer - EMF equation - Transformation ratio - Voltage regulation -Losses and Efficiency-All day efficiency- load test-Open circuit and short circuit tests-Sumpner's test- Applications.

UNIT V AUTO TRANSFORMER AND THREE PHASE TRANSFORMER 9

Construction and working of auto transformer-comparison with two winding transformers-Saving of copper-Applications of autotransformer-Three Phase Transformer Construction-types of connections-Scott connection-Applications of Scott connection.

Total:45 Periods

COURSE OUTCOMES

The student will be able to

CO1 Interpret the concepts of magnetic circuits and electromechanical energy conversion.

CO2 Demonstrate the construction and working principle of DC machines.

CO3 Illustrate the testing and speed control methods applicable to DC Motor.

CO4 Determine the performance of transformers.

CO5 Describe the working principle of auto transformer and three phase transformers.

TEXT BOOKS

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017.
2. P.S.Bimbhra,'Electrical Machinery',KhannaPublishers,2nd Edition,2021
3. B.L.Theraja, 'A text book of Electrical Technology', Volume II. S. Chand Limited, 2017

REFERENCE BOOKS

1. P.C.Sen.,'PrinciplesofElectricalMachinesandPowerElectronics',JohnWiley&Sons, 2013
2. Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.
3. Cotton H ,"Advanced ElectricalTechnology",A H Wheeler and Company Publications, London, 2011

COs	**Programme Outcomes**												**Programme Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO 11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2										1	2	2
CO2	3	2	2									2	2	3	2
CO3	3	2	2									2	1	2	3
CO4	3	2	2									2	2	3	2
CO5	2	3	2									2	3	2	3

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

422EET06	IOT FOR ELECTRCIAL ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To apprise students with basic knowledge of IoT that paves a platform to understand physical and logical design of IOT
- To teach a student how to analyse requirements of various communication models and protocols for cost-effective design of IoT applications on different IoT platforms.
- To introduce the technologies behind Internet of Things (IoT).
- To explain the students how to code for an IoT application using Arduino/Raspberry Pi Open platform.
- To apply the concept of Internet of Things in real world scenario.

UNIT – I INTRODUCTION 9

Introduction to Internet of Things- Definition and importance- Characteristics of IoT- Physical design - Logical design - Functional blocks of IoT - Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT- Introduction to Big data analytics and embedded systems.

UNIT – II COMPONENTS IN INTERNET OF THINGS 9

Functional Blocks of an IoT Ecosystem – Sensors, Actuators, and Smart Objects – Control Units -Communication modules (Wifi, Mesh Module, GPS, GSM Modules) - communication networks: LAN, WAN, HAN, NAN, FAN, Wireless sensor networks (WSN).

UNIT – III IOT PROTOCOLS 9

Protocols-Physical layer- MAC layer- topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRa WAN- Routing over Low Power and Lossy Networks - Application Layer Protocols - CoAP and MQTT.

UNIT – IV IOT DESIGN AND TECHNOLOGY 9

IOT deployment for Raspberry Pi /Arduino platform-Architecture –Programming - Implementation of IoT with Raspberry Pi- Study of IOT Sensors-Tagging and Tracking.

UNIT -V IOT APPLICATIONS IN ELECTRICAL ENGINEERING 9

Smart Homes- Smart Appliances-Security and Safety. Smart Energy: Smart Meters, Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI), Real Time Pricing, Smart grid, Smart Cities: Smart Vehicles, Smart Lighting, Smart Parking etc.

TOTAL:45 PERIODS

COURSE OUTCOMES

The student will be able to

CO1 Explain the function blocks, three-layer model and five-layer model of IoT

CO2 Develop an understanding of various communication network: HAN, NAN, FAN, WAN and WSNs

CO3 Implement the various IoT Protocols

CO4 Select proper sensor technology for IoT application

CO5 Describe IoT applications in the field of Electrical Engineering

TEXT BOOKS

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman ,CRC Press, 2017
2. Adrian McEwen, Designing the Internet of Things, Wiley,2013.
3. Samuel Greengard, The Internet of Things, The MIT Press, 2015

REFERENCE BOOKS

1. Li, H., Ota, K., & Dong, M. Learning IoT in edge: Deep learning for the Internet of Things with edge computing, 2018.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
4. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015

	Programme Outcomes												**Programme Specific Outcomes**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3	2	2	1							2		
CO2	3	2	2	2	2	1							3		
CO3	3	2	2	2	2	1							3	2	
CO4	3	2	2	2	2	1							3	2	
CO5	3	2	2	2	2	1							3		

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

		L	T	P	C
422EEP07	**Linear Integrated Circuits Laboratory**	**0**	**0**	**2**	**1**

Course Objectives

- To understand the basics of linear integrated circuits and available ICs
- To understand characteristics of operational amplifier
- To apply operational amplifiers in linear and nonlinear applications
- To acquire the basic knowledge of special function ICs
- To design basic circuits using various ICs

List Of Experiments

1. Design of Inverting amplifiers.
2. Design of Non inverting amplifiers.
3. Design of Differentiator using IC 741.
4. Design of Integrator using IC 741.
5. Design of Half wave Precision rectifier using Op-amp.
6. Design of Astable multivibrator using IC 741.
7. Design of RC Phase shift oscillator using Op-amp.
8. Design of Wien bridge oscillator using Op-amp.
9. Design of Active low-pass filter using IC 741.
10. Design of Astable multivibrator by using 555 Timer.
11. Design of Regulated DC power supply using LM317.
12. Study of Voltage Controlled Oscillator (VCO).

TOTAL:45 PERIODS

Course Outcomes

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

CO1 Analyze the characteristics of op-amp.
CO2 Design basic application circuits using IC 741.
CO3 Design and construct waveform generators.
CO4 Analyze the design of multivibrator circuits using IC 555.
CO5 Construct regulated power supply circuit using LM 317.

COs	**Programme Outcomes**												**Programme Specific Outcomes**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3	2			1		2				3		
CO2	3	3	3	3			3		2			3	2	3	
CO3	2	2	3	2			2		2				2	2	
CO4	3	2	3	2			3		2			2	3	3	
CO5	3	3	3	2			3		2			3	2	2	

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

		L	T	P	C
422EEP08	**DC Machines and Transformers Laboratory**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES

- To expose the students to determine the characteristics of DC generator.
- To understand the speed control techniques of DC motor.
- To analyze performance aspects of various testing methods of transformer.
- To evaluate the various parameters of transformer by conducting suitable tests.
- To study and understand suitable methods for testing of three phase transformer.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of self-excited DCs hunt generator.
2. Load characteristics of DC compound generator.
3. Load characteristics of DC shunt motor.
4. Load characteristics of DC series motor.
5. Load characteristics of DC compound motor.
6. Speed control of DC shunt motor.
7. Swinburne's tests on DC shunt motor.
8. Hopkinson's test on DC motor–generator set.
9. Load test on single-phase transformer.
10. Open circuit and short circuit tests on single phase transformer.
11. Separation of no-load losses in single phase transformer.
12. Load test on 3-phase transformers.

TOTAL:45 PERIODS

COURSE OUTCOMES

The students will be able to

CO1 Experimentally determine the characteristics of different types of DC machines.
CO2 Demonstrate the speed control techniques of DC motor for industrial applications.
CO3 Predetermine the performance parameters of transformers.
CO4 Identify suitable methods for testing of transformer.
CO5 Illustrate load characteristics of three phase transformer.

COs	**Programme Outcomes**												**Programme Specific Outcomes**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO 11**	PO 12	PSO1	**PSO2**	**PSO3**
CO1	3	3	2				3					2	3	2	2
CO2	3	3	2				3					2	3	3	2
CO3	3	3	2				2					2	2	2	2
CO4	3	3	2				3					2	2	3	2
CO5	3	3	2				3					2	2	3	2

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

422VAP02	MATH SOLVERS (Common to ALL)	L	T	P	C
		0	0	2	1

Course Objectives:

To familiarize the software applications to solve Mathematical equations through programs.

LIST OF EXPERIMENTS

1. 2D plots for Cartesian and polar curves.
2. Finding partial derivatives and Jacobian of functions of several variables.
3. Applications to Maxima and Minima of two variables.
4. Solution of first-order ordinary differential equation and plotting the solution curves.
5. Numerical solution of system of linear equations, test for consistency and graphical representation.
6. Solution of system of linear equations using Gauss-Seidel iteration.
7. Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.
8. Finding gradient, divergent, curl and their geometrical interpretation.
9. Computation of basis and dimension for a vector space and Graphical representation of linear transformation.
10. Computing the inner product and orthogonality.
11. Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method.
12. Interpolation / Extrapolation using Newton's forward and backward difference formula.
13. Computation of area under the curve using Trapezoidal, Simpson's (1/3)rd and (3/8)th rule.
14. Solution of Second Order Ordinary Differential Equation and Plotting the Solution Curve.
15. Solution of Differential Equation of Oscillations of Spring with Various Load.

A minimum of TEN experiments shall be offered.

Suggested softwares: Mathematica/MatLab/Python/Scilab

Course Outcomes: At the end of the course the student will be able to:

CO: Apply the modern mathematical tools namely PYTHON / MATHEMATICA/ MATLAB/ SCILAB to solve mathematical equations existing in engineering problems.

WEBLINKS AND VIDEO LECTURES:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

REFERENCES:

Python Programming and Numerical Methods - A Guide for Engineers and Scientists,by Qingkai kong, Timmy Siauw, Alexandre Bayen- *Berkeley Python Numerical Methods*