K.L.N. COLLEGE OF ENGINEERING

Pottapalayam-630612, Sivagangai District

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

Estd: 1994

FIRST & SECOND YEAR

CURRICULA AND SYLLABI

REGULATIONS 2020

For Under Graduate Program

B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

(For the students admitted from the academic year 2020-2021 onwards)

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

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

VISION OF THE INSTITUTION

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society.

MISSION OF THE INSTITUTION

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry**.**

VISION OF THE DEPARTMENT

To become a high standard of excellence in Education, Training and Research in the field of Electrical & Electronics Engineering and allied applications.

MISSION OF THE DEPARTMENT

To produce excellent, innovative and Nationalistic Engineers with Ethical Values and to advance in the field of Electrical & Electronics Engineering and allied areas.

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To excel in industrial or graduate work in Electrical and Electronics Engineering and allied fields.

PEO 2 To practice their Professions conforming to Ethical Values and Environmentally friendly policies.

PEO 3 To work in international and multi-disciplinary Environments.

PEO 4 To successfully adapt to evolving Technologies and stay current with their Professions.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1 Apply the fundamentals of Mathematics, Science and Engineering knowledge to identify, formulate, design and investigate complex engineering problems of Electric Circuits, Analog and Digital Electronic Circuits, Electrical Machines and Power Systems.

PSO 2 Apply appropriate techniques and modern Engineering hardware and software tools in Power Systems to engage in life- long learning and to successfully adapt in multidisciplinary environments.

PO1: Engineering knowledge

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

PO2: Problem analysis

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

PO3: Design/development of solutions

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

PO4: Conduct investigations of complex problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage

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

PO6: The engineer and society

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

PO7: Environment and sustainability

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

PO8: Ethics

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

PO9: Individual and team work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

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

PO11: Project management and finance

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

PO12: Life-long learning

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

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REGULATIONS 2020

For Under Graduate Program

B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

CATEGORY OF COURSES

i. **Humanities and Social Sciences (HS) Courses** include Technical English, Environmental Science and Engineering, Engineering Ethics and human values, Communication Skills and Management courses.

ii. **Basic Sciences (BS**) **Courses** include Mathematics, Physics, and Chemistry.

iii. **Engineering Sciences (ES) Courses** include Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering / Instrumentation etc.

iv. **Professional Core (PC) Courses** include the core courses relevant to the chosen programme of study.

v. **Professional Elective (PE) Courses** include the elective courses relevant to the chosen programme of study.

vi. **Open Elective (OE) Courses** include courses from other departments which a student can choose from the list specified in the curriculum of the students B.E. / B.Tech. Programmes.

vii. **Employability Enhancement Courses (EEC)** include Project Work and/or Internship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.

viii. **Mandatory (MC) Courses** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc

SEMESTER I

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

S. No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
	THEORY							
1	20HS101	English for Technical Communication	HS	3	3	0	0	3
2	20BS101	Fundamentals of Engineering Mathematics	BS	4	3	1	0	4
3	20BS102	Engineering Physics	BS	3	3	0	0	3
4	20BS103	Engineering Chemistry	BS	3	3	0	0	3
5	20GE101	Problem Solving using Python Programming	ES	3	3	0	0	3
	PRACTICAL							
6	20BS1L1	Basic Science Laboratory	BS	3	0	0	3	1.5
7	20GE1L1	Python Programming Laboratory	ES	4	0	0	4	2
8	20GE1L2	Industrial Practices Workshop	ES	3	0	0	3	1.5
TOTAL				26	15	1	10	21

SEMESTER II

S. No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
	THEORY							
1	20HS201	Advanced Technical Communication **(Common to all B.E./B.Tech programmes)**	HS	3	3	0	0	3
2	20BS201	Laplace Transform and Advanced Calculus **(Common to all B.E/B.Tech programmes)**	BS	4	3	1	0	4
3	20BS203	Physics for Electronics Engineering **(Common to B.E. EEE, B.E. ECE and B.E. EIE programmes)**	BS	3	3	0	0	3
4	20CS201	Programming in C **(Common to B.E EEE, B.E EIE, B.E CSE, B.Tech IT & B.Tech AIDS programmes)**	ES	3	3	0	0	3
5	20EE201	Electric Circuit Analysis	PC*	4	3	1	0	4
6	20GE201	Engineering Graphics **(Common to all B.E./B.Tech programmes)**	ES	4	2	0	2	3
	PRACTICAL							
7	20CS2L1	C Programming Laboratory **(Common to B.E EEE, B.E EIE, B.E CSE, B.Tech IT & B.Tech AIDS programmes)**	ES	4	0	0	4	2
8	20EE2L2	Electric Circuits Laboratory	PC*	4	0	0	4	2
TOTAL				29	17	2	10	24

*** Common to B.E. EEE & B.E. EIE programmes**

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20BS301	Transforms and Partial Differential Equations **(Common to Mech, EEE & AUE programmes)**	**BS**	4	3	1	0	4
2.	20EE301	Digital Logic Circuits	**PC***	3	3	0	0	3
3.	20EE302	Electron Devices and Circuits	**PC***	3	3	0	0	3
4.	20EE303	Electromagnetic Theory	**PC**	4	3	1	0	4
5.	20EE304	Electrical Machines – I	**PC**	4	3	1	0	4
6.	20HS301	Universal Human Values **(Common to all B.E./B.Tech programmes)**	**HS**	3	2	1	0	3
PRACTICALS								
7.	20EE3L1	Electronics Laboratory	**PC***	3	0	0	3	1.5
8.	20EE3L2	Electrical Machines Laboratory – I	**PC**	3	0	0	3	1.5
TOTAL				**27**	**17**	**4**	**6**	**24**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	20BS402	Numerical Methods	**BS***	4	3	1	0	4
2.	20EE401	Electrical Machines – II	**PC**	4	3	1	0	4
3.	20EE402	Transmission and Distribution	**PC**	3	3	0	0	3
4.	20EE403	Linear Integrated Circuits and Applications	**PC***	3	3	0	0	3
5.	20EE404	Measurements and Instrumentation	**PC**	3	3	0	0	3
6.	20HS401	Environmental Science and Engineering **(Common to all B.E./B.Tech programmes)**	**HS**	2	2	0	0	2
PRACTICALS								
7.	20EE4L1	Electrical Machines Laboratory – II	**PC**	3	0	0	3	1.5
8.	20EE4L2	Linear and Digital Integrated Circuits Laboratory	**PC***	3	0	0	3	1.5
9.	20EE4L3	Technical Seminar	**EEC**	2	0	0	2	1
TOTAL				**27**	**17**	**2**	**8**	**23**

*** Common to B.E EEE & B.E. EIE programmes**

20HS101 ENGLISH FOR TECHNICAL COMMUNICATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- This course is designed for entry level Engineering and Technology curriculum enabling the students to learn, acquire and apply for their learning and career.
- The course is aimed at providing effective skills for promoting communication skills through English.
- Students will benefit in conversing with the peers, faculty and fellow professionals.
- The outcome of this course contains refined level of English proficiency by acquiring all four skills, listening, speaking, reading and writing to prepare them for global readiness.

PRE-REQUISITE: NIL

UNIT - I FOCUSING LANGUAGE DEVELOPMENT 9

Listening: Listening to TV News, Guest Lecturers, Note – taking. **Speaking**: Pronunciation Common Vocabulary – Technical Vocabulary – Answering Peer Questions – Conversation with Teacher. **Reading**: News magazines, Reading for unfamiliar words, Variety of News Items

Writing: Word formation – Auxiliary verbs – Modal Verbs – Sentence Types – Affirmative, Negative, Interrogative, Concord – Dialogue Writing, Letter to Principal / Director – Instructions using Auxiliary

UNIT - II GRAMMAR AND TECHNICAL READING 9

Listening: Listening to Peer Conversations – Brief Speeches – Listening for Specific Information – Recap of Speeches. **Speaking**: Wh Questions, Day today conversations, Telephonic enquiries official/formal enquiries. **Reading**: Technical Essays – Identifying Sentence Types – Classifying the verb patterns. **Writing**: Tenses – Simple Present, Present Progressive, Present Perfect, Present Perfect Continuous – Voice – Active & Passive – Précis Writing – Essay Writing

UNIT - III GRAMMAR AND LANGUAGE DEVELOPMENT 9

Listening: TV interviews, Commentaries, Digital Videos for World Information. **Speaking**: Telephonic Conversation – Classroom Activities – Conversing Information. **Reading**: Coherence, Development of Thoughts. **Writing**: Tenses – Simple Past, Past Progressive, Past Perfect, Past perfect continuous – Impersonal Passive-Narrating the past events, Letter to friend/father about Industrial Visit/Functions held – Narrating the past experience using Impersonal Passive voice

UNIT - IV READING AND LANGUAGE DEVELOPMENT 9

Listening: Listening to Dialects of English – British & American Regional. **Speaking**: Role Plays, Extempore, Responding to specific questions. **Reading**: Comprehensive passages, Reading for specific points. **Writing**: Tenses – Simple Future, Future progressive, Future Perfect, Future Perfect continuous – Definition – Phrases of Reason – Cause & Effect, Recommendations, Argumentative Essays, Letter to the Editor on Social Issues – Analytical Essays on Social hazards using Cause and Effect.

UNIT - V EXTENDED WRITING 9

Listening: Listening to Technical Seminar speeches – Listening to achievers, eminent personalities – Dialects – Australian – African – Asian. **Speaking**: Welcome address, Compeering, Vote of Thanks, Peer debates. **Reading**: Texts on self-confidence, motivation, success path. **Writing**: Contracted forms, Conditionals, Articles, Preposition, Tense – 'going to' - Error Spotting, Sequence Words – Rearranging – Writing a Book Review – Summary writing – Rearranging Sentences using Sequence Words, Note Making

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Listen, Comprehend and Correspond with others at various contexts
- Speak legibly and fluently under various life-time situations by applying proper communication modules.
- Read and understand a variety of writings and technical text by analyzing the meaning and language.
- Apply clear and legible writing skills in error free style in coherent manner
- Remember and use various communicative skills in precise and efficient way on technological contexts
- Form situational conversations and technical writing styles for interpersonal and effective communication

TEXT BOOKS:

1. Board of Editors. "Using English A Course book for Undergraduate Engineers and Technologists". Orient Black Swan Limited, Hyderabad: 2015
2. Richards, C. Jack. "Interchange Students' Book-2", New Delhi: CUP, 2015

REFERENCES:

1. Murphy, Raymond "English Grammar in Use with Answers: Reference and Practice for Intermediate Students", Cambridge: CUP, 2004
2. Thomson, A.J. and Martinet, A.V. "A Practical English Grammar", OUP, New Delhi: 1986
   Anne Laws, "Writing Skills", Orient Black Swan, Hyderabad, 2011
3. Board of Editor, "English for Technical Communication", Great Mind Publication, Chennai 2018

20BS101 FUNDAMENTALS OF ENGINEERING MATHEMATICS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To relate various methods of Matrix Algebra to handle practical problems arising in the field of engineering.
- The main aim of this course is to achieve conceptual understanding and to retain the best traditions of Calculus.
- The syllabus is designed to provide the basic tools of Calculus of Single and Multivariable, mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.

PRE-REQUISITE: NIL

UNIT - I MATRICES 12

Introduction to Matrices-Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a Quadratic form to Canonical form by Orthogonal transformation – Nature of Quadratic forms.

UNIT - II DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Differentiation of Polynomials, Exponential, Trigonometric, Hyperbolic, Logarithmic and Implicit functions- Maxima and Minima of functions of single variable.

UNIT – III FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT – IV INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

UNIT – V ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Find the Eigen values and Eigen vectors to diagonalize a matrix, reduce quadratic form to canonical form.
- Apply the concept of limits, continuity and rules of differentiation to differentiate some standard functions and apply the techniques of differentiation to differentiate various types of functions.

- Understand the concepts of Concavity and Convexity by finding the Critical points, point of Inflection and to find Maxima and Minima functions of Single variable.
- Find the derivatives of functions of two variables and apply them to calculate the maxima and minima.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Apply various techniques to solve higher order differential equations with constant and variable coefficients.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. T. Veerarajan., "Engineering Mathematics I", The Tata Mc Graw Hill Publication-New Delhi, First Edition, 2018

REFERENCES:

1. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015. [For units II & III].
2. 2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2006.
3. Wiley, "Calculus- International Student version", 10th Edition, Wiley India Pvt. Ltd, New Delhi 2017.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
5. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 9th Edition, 2014.

20BS102	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To inculcate the fundamental knowledge in properties of matter and crystal physics.
- To enrich the knowledge on Laser, fiber optics and ultrasonics and their applications relevant to various streams of Engineering and Technology.
- To introduce quantum physics and its applications

PRE-REQUISITE: NIL

UNIT - I PROPERTIES OF MATTER **9**

Elasticity – Hooke's Law – Stress-strain diagram and its uses – Three modulus of elasticity (qualitative) – Poisson's ratio – factors affecting elastic modulus and tensile strength – twisting couple – torsional pendulum: theory and experiment – bending of beams – bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment – **I** -shaped girders.

UNIT - II LASER AND FIBER OPTICS **9**

Lasers: Interaction of radiation with atomic energy states – Einstein's A and B coefficients derivation – Population inversion – resonant cavity, optical amplification (qualitative) – solid state lasers – Nd:YAG laser, Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle – types of optical fibers (material, refractive index, mode) – losses associated with optical fibers – fiber optic sensors: pressure and displacement sensor.

UNIT - III ULTRASONICS **9**

Ultrasonics – classification (qualitative) – properties – generation – magnetostriction and piezoelectric methods – detection of ultrasound – cavitations – velocity measurement – acoustic grating – Industrial applications (Drilling, Welding, Soldering and Cleaning) – SONAR – NDT – Pulse Echo system through Transmission and Reflection modes – A, B and C scan displays - Medical application – sonogram.

UNIT - IV QUANTUM PHYSICS **9**

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunneling (qualitative) – scanning tunneling microscope.

UNIT - V CRYSTAL PHYSICS **9**

Crystalline and amorphous materials – unit cell, crystal systems, Bravais lattices, lattice planes - Miller indices – Inter planar spacing in cubic lattice – coordination number and packing factor for SC, BCC, FCC, HCP structures – growth of single crystals: solution and melt growth techniques – Mechanisms of plastic deformation, slip and twinning.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Demonstrate the properties of elasticity and measure the different moduli of elasticity.
- Examine the characteristics of laser and optical fiber
- Apply the concepts of ultrasonics in engineering
- Explain black body radiation, properties of matter waves and Schrodinger equation
- Classify the Bravais lattices and different types of crystal structures
- Gain information on growth of crystals and deformations

TEXT BOOKS:

1. R. K. Gaur and S. L. Gupta, “Engineering Physics”, Dhanpat Rai Publications, 2012.
2. B. K. Pandey and S. Chaturvedi, “Engineering Physics”, Cengage Learning India, 2018.
3. V.Rajendran, “Engineering Physics”, Tata McGraw Hill Education Private Limited, 2011.

REFERENCES:

1. D.Halliday, R. Resnick and J. Walker, “Principles of Physics”, Wiley publisher, 10th Edition, 2015.
2. R.A.Serway and J.W. Jewett, “Physics for Scientists and Engineers”, Cengage Learning, 2014.
3. P.A.Tipler and G. Mosca, “Physics for Scientists and Engineers with Modern Physics”, W.H.Freeman, 2007.
4. D.K.Bhattacharya and T. Poonam, “Engineering Physics”, Oxford University Press, 2017.

20BS103	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students, familiar with boiler feed water requirements, related problems and water treatment techniques.
- To learn the principle of electrochemical cell, types of corrosion and its control.
- To develop an understanding of the basic concepts of phase rule and its applications to one and two component systems and appreciate the purpose and significance of alloys.
- To be familiar with different types of fuel and their characteristics and also functioning of energy storage devices.
- To understand the techniques of spectra and chromatography for analytical purpose.

PRE-REQUISITE: NIL

UNIT - I WATER AND ITS TREATMENT 9

Characteristics of water; Hard water, Soft water, difference; Hardness – types of hardness, expression of hardness, units, removal of hardness (boiling, soda lime process), estimation of hardness of water by EDTA method (problems); Boiler feed water – requirements – disadvantages of using hard water in boilers (scale and sludge, priming and foaming, caustic embrittlement, boiler corrosion); Treatment of boiler feed water – internal treatment (carbonate, phosphate, and calgon conditioning) external treatment – ion exchange process, zeolite process**;** Purification of water - reverse osmosis, electro dialysis, Application of nanomaterials in water purification.

UNIT - II ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation potential- reduction potential, - electrochemical series and its significance - Nernst equation (derivation and problems).

Corrosion- causes- factors, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method **–** corrosion inhibitors. Metallic coating – Electroplating – Factors - Electroplating of Copper and Electroless plating of Nickel.

UNIT - III PHASE RULE AND ALLOYS 9

Phase rule - introduction, definition of terms with examples; One component system - water system; Reduced phase rule - two component system, classification, lead-silver system; Alloys – introduction, definition, properties of alloys, significance of alloying; Functions and effects of alloying elements; Heat treatment of steel - annealing, hardening, tempering, carburizing, nitriding; Ferrous alloys- nichrome and stainless steel (18/8); Non-ferrous alloys – brass and bronze.

UNIT - IV FUELS AND BATTERIES 9

Fuels – classification, characteristics; Petrol – characteristics, knocking, octane number; Diesel – characteristics, cetane number; Natural gas (CNG), LPG, Power alcohol, Biodiesel, Gasohol; Combustion of fuels – calorific value, GCV and NCV (Problems),calculation of theoretical air for combustion (Problems), Ignition temperature, explosive range, flue gas analysis (Orsat apparatus);

Batteries – primary and secondary batteries, lead-acid battery, lithium ion battery, Fuel cell (hydrogen oxygen fuel cell).

UNIT - V ANALYTICAL TECHNIQUES 9

Spectroscopic techniques – UV-visible (Principle and Instrumentation – Block Diagram only and applications), IR (Principle and Instrumentation – Block Diagram only and applications), ^{1}H NMR ((Principle and Instrumentation – Block Diagram only) – Chromatography – HPLC - Flame photometry – Estimation of sodium by Flame photometry.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Identify the problems of hardness of water in boilers and to treat water by various methods.
- Construct electrochemical cell and apply Nernst equation for an electrochemical cell and identify various methods to control corrosion.
- Analyse the phase diagram of one component and two component system and describe the various methods of heat treatment of steel.
- Categorise the various types of fuels by their characteristics and analyse the flue gas by Orsat's method.
- Illustrate the working of lead acid battery, lithium ion battery and fuel cell.
- Describe the instrumentation and working of UV, IR, ^{1}HNMR, HPLC, and flame photometry.

TEXT BOOKS:

1. P.C. Jain and Monika Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2017
2. S.S Dara and S.S Umare, "A Text Book of Engineering Chemistry", S.Chand & Company Limited, 20th Edition, 2018

REFERENCES:

1. Shashi Chawla, "A Textbook of Engineering Chemistry", Dhanpat Rai & CO. (PVT) LTD, New Delhi, 2012.
2. B.R. Puri, L.R. Sharma, M.S. Pathania, Vishal, "Principles of Physical Chemistry", Vishal Publishing Co., Punjab, 47th Edition, 2017.
3. G Palanna, "Engineering Chemistry", McGraw Hill Education (India) PVT, LTD, Chennai, 2017.
4. Dr. Sunita Rattan, "A Textbook of Engineering Chemistry", S.K.Kataria & Sons, New Delhi, 2012

20GE101	PROBLEM SOLVING USING PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To know the basics of Computers and algorithmic problem solving
- To understand Python programs with conditional and looping constructs.
- To define Python functions and strings.
- To use Python data structures – lists, tuples, sets and dictionaries.
- To do input/output with files in Python.

PRE-REQUISITE: NIL

UNIT - I COMPUTER FUNDAMENTALS AND PROBLEM SOLVING 9

Introduction to Computer System – Block Diagram of Computer, Types of Memory, I/O Devices, Application Programs, System Programs – Loader, linker, assembler, compiler, interpreter, Programming process – source code to executable code, Problem Solving Strategies – Problem analysis, Algorithms, Flow Charts, Pseudo Code. Illustrative problems: odd or even number, Leap year, Biggest of three numbers, square root of a number, Sum of n numbers, Armstrong number, Palindrome, Fibonacci Series, Prime number, Bubble Sort and Linear Search.

UNIT - II DATA, EXPRESSIONS, CONTROL FLOW STATEMENTS 9

Python interpreter and interactive mode, values and types – int, float, boolean, string, and list, variables, expressions, statements, tuple assignment, operators and precedence of operators, comments, Control Flow Statements – Conditionals – conditional (if), alternative (if-else), chained conditional (if-elif-else), Iteration – state, while, for, break, continue, pass, Illustrative programs – exchange the values with and without using temporary variables, circulate the values of n variables, distance between two points.

UNIT - III FUNCTIONS, STRINGS 9

Functions – function definition and use, flow of execution, parameters and arguments, function composition, Fruitful functions – return values, parameters, local and global scope, recursion, Strings – string slices, immutability, string functions and methods, string module, Illustrative programs – square root, GCD, exponentiation, Factorial of a number, linear search, binary search.

UNIT - IV LISTS, TUPLES, SETS DICTIONARIES 9

Lists – list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, Lists as arrays, Tuples – tuple assignment, tuple as return value, Sets - Creating a set, Modifying a set, Removing elements from a set, Set operations- Set Union, Set intersection, Set difference, Set membership test, Iterating through a set, Set methods, Built-in functions with set, Frozenset - Dictionaries – operations and methods, Advanced list processing –List comprehension, Illustrative programs – selection sort, insertion sort, Matrix addition and subtraction, sum an array of numbers.

UNIT - V FILES, MODULES, PACKAGES 9

Files and exception – text files, reading and writing files, format operator, command line arguments, errors and exceptions, handling exceptions, modules, packages – Math and Rand, Illustrative programs – word count, copy file, merge two files.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain Components of a Computer System, types of programming languages, types of software with examples and purpose.
- Perform problem analysis, use algorithms and prepare flow charts, pseudo code for solving simple problems.
- Use Conditional, iteration constructs of python programming and apply to solve simple problems.
- Use Functions, recursive function, String functions in python programming and apply to perform linear and binary search.
- Explain the various operations for manipulating Tuples, Dictionaries and Use List to perform simple and sorting operations.
- Explain file handling operations, exception handling, modules and packages and illustrate programs for word count, file copy, merge operations and exception handling.

TEXT BOOKS:

1. E. Balagurusamy, “Problem solving and Python Programming”, First edition, McGraw Hill Education (India) Private Limited, 2017.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016. (http://greenteapress.com/wp/think-python/)

REFERENCES:

1. Yashavant Kanetkar, Aditya Kanetkar, “Let Us Python”, 2nd Edition, BPB Publications, 2020.
2. John V Guttag, “Introduction to Computation and Programming Using Python: With Application to Understanding Data”, 2nd Edition, PHI Publisher, 2017.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3.6”, 3rd edition, Shroff/O’ ReillyPublishers, 2018.
6. Dr. A. Kannan, Dr. L. Sai Ramesh, “Problem Solving and Python Programming, Updated Edition”, United Global Publishers Pvt. Ltd., April 2018.

20BS1L1 **BASIC SCIENCE LABORATORY**

L	T	P	C
0	0	3	1.5

PHYSICS LABORATORY

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in Optics, properties of matter and liquids.

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS
(Any five to be carried out & one demonstration experiment)

1. Determination of Rigidity modulus – Torsional Pendulum.
2. Determination of Young's modulus – Non Uniform Bending.
3. a. Determination of wavelength and particle size using diode laser.
   b. Determination of acceptance angle in an optical fiber.
4. Determination of velocity of sound and compressibility of liquid using ultrasonic interferometer.
5. Determination of band gap of a semiconductor diode.
6. Determination of thickness of a thin wire – Air wedge method.
7. Determination of dispersive power of a prism – Spectrometer*
8. Determination of wavelength of mercury spectrum – Spectrometer grating

*Demonstration experiment

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Evaluate moment of inertia of a disc and rigidity modulus for thin wire using Torsional pendulum
- Appraise Young's modulus of material of the given beam by Non-Uniform bending method
- Measure the wavelength of laser light , Particle size and basic parameter of optical fiber using Semiconductor diode LASER
- Estimate velocity of ultrasound and compressibility of liquid
- Estimate the wavelength of the prominent spectral lines
- Utilize experiment kits for useful applications

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Torsional pendulum set	6
2	Travelling microscope & accessories	6
3	Laser kit	6
4	Ultrasonic interferometer	6
5	Semiconductor band gap kit	6
6	Air wedge set up	6
7	Spectrometer & prism	6
8	Spectrometer & Grating	6

CHEMISTRY LABORATORY

OBJECTIVES:

- To make the students to acquire practical skill in the determination of water quality parameters through volumetric analysis.
- To have hands on experience in using instruments like pH meter, conductivity meter, potentiometer.
- To acquaint the students with the determination of molecular weight of polymer by viscometer.

PRE-REQUISITE: NIL

Any Five experiments to be given

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of dissolved oxygen content of water sample by Winkler's method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Estimation of iron content of the given solution using potentiometer.
6. Conductometric titration of a strong acid Vs a strong base.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Corrosion Experiment – Weight Loss Method.
10. Estimation of sodium present in water using flame photometer.

TOTAL(Physics & Chemistry): 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Estimate the Chemical quality parameter of a water sample.
- Estimate the strength of acid by conductometric and pH metric titration..
- Estimate the strength of oxidisable material present in given sample by potentiometry.
- Determine the molecular weight of polymer by Ostwald viscometer.
- Demonstrate the rate of corrosion by weight loss method.

REFERENCE:

1. Vogel's "Text book of quantitative chemical analysis" (8^{th} edition, 2014)

LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Burette	30
2	Pipette	30
3	Beaker (100ml)	30
4	Conical Flask (250ml)	30
5	Conductivity meter	10
6	Potentiometer	10
7	pH meter	10
8	Viscometer	10
9	Flame Photometer	1
10	Electronic Balance	1

20GE1L1	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To write, test, and debug simple Python programs using conditional statements.
- To implement Python programs using loops.
- To use functions for structuring Python programs.
- To implement Python programs using lists.
- To write Python programs for implementing file operations.

PRE-REQUISITE: NIL

LIST OF PROGRAMS

1. Biggest of three numbers, odd or even number, Leap year.
2. GCD, Armstrong Number, Palindrome, Fibonacci Series, Prime number
3. Find the square root and exponentiation of a number with and without built-in functions
4. Linear search and Binary search using Recursion.
5. Find the maximum of a list of numbers
6. Selection sort, Insertion sort
7. First n prime numbers
8. Transpose of a Matrix
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Merge two files

PLATFORM NEEDED: Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop simple Python programs using conditional and iterative constructs.
- Develop simple Python programs using built-in functions and user-defined functions.
- Develop a Python program using recursion to implement linear and binary search.
- Develop a Python program using list to implement selection and insertion sort.
- Develop Python programs to implement matrix operations.
- Develop a Python program to implement file handling.

20GE1L2	INDUSTRIAL PRACTICES WORKSHOP	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To provide exposure to the students with Hands on Experience on various Basic Industrial Practices in Civil, Mechanical, Electrical and Electronics Engineering.

PRE-REQUISITE: NIL

GROUP A (CIVIL & MECHANICAL)
LIST OF EXPERIMENTS

I CIVIL ENGINEERING PRACTICE

UNIT - I CARPENTRY PRACTICE

1. Study of carpentry tools.
2. Preparation of Cross lap joint
3. Preparation of Dovetail joint
4. Preparation of T joint

UNIT - II PLUMBING PRACTICE

1. Study of plumbing tools, pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.
2. Exercise on Preparation of plumbing line sketches for water supply and sewage works.
3. Exercise on providing of basic water line connection for a residential house using plumbing components.
4. Exercise on providing Water line pipe connections for household utilities like water heater, wash basin etc.,

II MECHANICAL ENGINEERING PRACTICE

UNIT - III SHEET METAL PRACTICE

1. Study of sheet metal forming tools.
2. Preparation of a Model of rectangular tray.
3. Preparation of a Model of Conical Funnel.

UNIT - IV MACHINING PRACTICE

1. Study of machining tools.
2. Exercise on Simple turning, Facing, Chamfering
3. Exercise on Taper turning.
4. Exercise on Drilling and Tapping.

UNIT – V METAL JOINING PROCESS

1. Study of welding tools.
2. Exercise to join two metal plates by single butt joint using arc welding.
3. Exercise to join two metal plates by T Fillet joint using arc welding.
4. Exercise to join two metal plates by lap joint using arc welding.

DEMONSTRATION

1. Gas welding process.
2. Refrigeration and Air conditioning process.

GROUP B (ELECTRICAL & ELECTRONICS)
LIST OF EXPERIMENTS

I ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, Fluorescent lamp and Energy Meter.
2. Measurement of Power consumption for CFL, Fluorescent Lamp, LED Lamp and Incandescent lamp.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

II ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components – Resistor colour coding, Capacitor, Inductor- Measurement using LCR meter, Transistor & Diode – Terminal identification using Multimeter.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Measurement of AC signal parameter (peak-peak, rms value, period & frequency) using CRO and AFO.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS		
CIVIL		
S.No	**Component Name**	**No. of Components**
1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, coupling, unions, elbows, plugs and other fittings	15 sets
2	Carpentry Vice (fitted to work bench)	15 nos
3	Standard wood working tools	15 sets
4	Models of industrial trusses, door joints, furniture joints	5 each
5	Power Tools a. Rotary Hammer b. Demolition Hammer c. Circular Saw d. Planer e. Hand Drilling Machine f. Jigsaw	 2 nos 2 nos 2 nos 2 nos 2 nos 2 nos

MECHANICAL		
1	Arc welding transformer with cables and holders	5 nos
2	Welding booth with exhaust facility	5 nos
3	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 sets
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 nos
5	Centre Lathe	2 nos
6	Power Tool: Angle Grinder	2 nos
7	Study purpose items: Refrigerator and Air Conditioner	One each
ELECTRICAL		
1	Assorted electrical components for house wiring	10 sets
2	Electrical measuring instruments	10 sets
3	Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4	Megger (250V/500V)	1 no.
5	Power Tools a. Range Finder b. Digital Live-wire detector	 2 nos 2 nos
ELECTRONICS		
1	Soldering guns	10 nos
2	Assorted electronic components for making circuits	50 nos
3	Small PCBs	10 nos
4	Multimeters	10 nos
5	Regulated of power supply, CRO	1 no. each

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Prepare different carpentry joints.
- Prepare pipe connections with different joints for domestic applications.
- Make the models using sheet metal works.
- Carry out the basic machining operations.
- Prepare joints using welding equipment's.
- Demonstrate on gas welding, refrigeration and air conditioning processes.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

20HS201	ADVANCED TECHNICAL COMMUNICATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- This course is designed for Engineering and Technology curriculum enabling the students to learn, acquire and apply updated elements of English communication.
- The course is aimed at providing effective skills for procuring communication skills for business and advanced technology.
- Students will benefit by learning the four skills – Listening, Speaking, Reading and Writing – to meet the global requirements for their career and higher studies.

PRE-REQUISITE: NIL

UNIT - I TECHNICAL WRITING 9

Listening: Listening to audio-visuals on personal Interviews, Speeches from Company CEOs, TV Debates. **Speaking**: Wishing, Greeting, Enquiring Hobbies. **Reading**: Editorials, Letter to the Editor Columns, Technical Papers. **Writing**: Analytical writings, Emphasis Techniques, Letter Writing – Business Correspondence, Abstract Writing, Common Errors, Footnotes, Compound words, Preparation of Agenda

UNIT - II BUSINESS ENGLISH AND LANGUAGE DEVELOPMENT 9

Listening: Listening to Audio-Visual documentary, TV Programs of Celebrities Forum. **Speaking**: Self-Expression, Introducing the fellow students, Talking about celebrities, leaders

Reading: Company Correspondence, Business Correspondence, Technical Text for Vocabulary

Writing: Bibliography, Sentence Completion, Cloze exercises, Verbal Analogy, Letter – Business enquiry orders, payments, Minutes Preparation.

UNIT - III VISUAL BASED LANGUAGE DEVELOPMENT 9

Listening: Visuals on Group Discussion-Understanding the nuances of GD – Approach – Content – Methodology. **Speaking**: Discussing main points on burning issues, Social issues – Expressing ideas and suggestions. **Reading**: Etiquettes of Non-Verbal Communication. **Writing**: List of common expressions for specified situations – Sentence linkers – Formal Expressions – Suggestions – Reported Speech - Letter to the Editor on Common Issues – Writing the Points in Indirect Form – Check Lists – Numerical Expression

UNIT - IV EMPLOYABILITY CORRESPONDENCE 9

Listening: Listening to Visuals of Technical Paper presentation – Technical and HR interviews

Speaking: Peer-to-Peer Interview – Mock Interview – Telephone Conversations. **Reading**: Comparative Analyses – Instructions on Public Spots – Time Management concepts – Email Correspondence. **Writing**: Compare and Contrast – Cause and Effect – Purpose and Function – Job Application Letter – Drafting Resume / CV,– Inferring the graphical / Pictorial representations – Bar chart – Pie chart, Instruction – common and technical instructions for a process or a component

UNIT - V TECHNICAL REPORT WRITING 9

Listening: Key note speeches – Annual Reports of institutions / companies. **Speaking**: Answering to the Mock Panel Interview – Sharing of interview experiences – presenting a Technical Paper. **Reading**: Annual Reports – Company Reports – Newspaper reports – Comprehension passages. **Writing**: Homophones – Abbreviations and Acronyms – SI Units – Report Writing with recommendations – Inferring the Graph – Flow Chart – Tables – Technical Papers

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Listen, Understand and create technical correspondence at advanced level
- Respond or answer to the contextual questions, interview questions, form instructions, draft reports
- Speak and analyze social issues, come out with effective ideas for discussion, understand the passages for meaning and vocabulary
- Assess error free technical writings, create legible and coherent technical papers, derive ideas of the given texts in a precise form
- Remember the updated elements of communication skills, nuances of non-verbal communication, business communication
- Create technical instructions, process instructions, self-appraisals, Resumes, reports on various situations

TEXT BOOKS:

1. Board of editors. “Fluency in English A Course book for Engineering and Technology”. Orient Blackswan, Hyderabad: 2016
2. Raman, Meenakshi and Sharma, Sangeetha “Technical Communication Principles and Practice”. Oxford University Press: New Delhi, 2014.

REFERENCES:

1. Booth-L. Diana, “Project Work”, Oxford University Press, Oxford: 2014
2. Grussendorf, Marion, “English for Presentations”, Oxford University Press, Oxford: 2007
3. Means, L. Thomas and Elaine Langlois, “English & Communication For Colleges”. Cengage Learning, USA: 2007
4. Board of Editor, “Advanced Technical Communication”, Great Mind Publication, Chennai : 2019

20BS201	LAPLACE TRANSFORM AND ADVANCED CALCULUS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To make the student familiar with topics such as Multiple Integrals, Vector Calculus, Analytic Functions, Complex Integration and Laplace Transform.
- To learn the concept of basic Vector Calculus which can be widely used for Modeling the various laws of Physics.
- To understand the various methods of Complex Analysis and Laplace Transform can be used for efficiently solving the problems that occur in various branches of Engineering disciplines.

PRE-REQUISITE: NIL

UNIT - I LAPLACE TRANSFORM 12

Existence Conditions – Transforms of Elementary Functions – Transform of Unit Step Function and Unit Impulse Function – Basic Properties – Shifting Theorems -Transforms of Derivatives and Integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of Periodic Functions – Application to Solution of Linear Second Order Ordinary Differential Equations with Constant Coefficients.

UNIT - II MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in Polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of Variables in Double and Triple integrals.

UNIT - III VECTOR CALCULUS 12

Gradient and Directional Derivative – Divergence and Curl - Vector Identities – Irrotational and Solenoidal Vector fields – Line Integral over a Plane curve – Surface Integral - Area of a Curved Surface - Volume Integral – Green's, Gauss divergence and Stoke's theorems – Verification and Application in evaluating Line, Surface and Volume Integrals.

UNIT - IV ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and Sufficient Conditions for Analyticity in Cartesian and Polar Coordinates – Properties – Harmonic Conjugates – Construction of Analytic Function – Conformal Mapping – Mapping by Functions w = z+c, cz, 1/z , z2 -Bilinear transformation.

UNIT - V COMPLEX INTEGRATION 12

Line integral – Cauchy's Integral Theorem – Cauchy's Integral Formula – Taylor's and Laurent's Series – Singularities – Residues – Residue Theorem – Application of Residue Theorem for Evaluation of Real Integrals – Use of Circular Contour.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Understand the properties of Laplace transforms and to find the Laplace transform of some standard functions.
- Apply Laplace transform and inverse transform to solve the initial value problems.
- Solve the multiple integrals and apply the concept to find areas, volumes.
- Evaluation of line, surface and volume integrals using Green's, Gauss and Stokes

theorems.

- Determine Analytic functions, Bilinear Transformations and apply the concept of conformal mapping to find the images of given curves.
- Evaluation of Contour Integrals using Cauchy's Integral and Residue theorems.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. T. Veerarajan., "Engineering Mathematics I", The Tata Mc Graw Hill Publication-New Delhi, First Edition 2018.

REFERENCES:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, NewDelhi, 2006.
2. James Stewart, "Calculus, Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics II", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 9th Edition, 2014.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics II", Narosa Publications, New Delhi, 5th Edition, 2016.
5. Sastry, S.S. "Engineering Mathematics", Vol.I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.

20BS203 PHYSICS FOR ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the essential physics of semiconductor device and electron transport properties.
- To inculcate proficiency in dielectric and optical properties of materials.
- To develop the knowledge on nano electronic devices.

PRE-REQUISITE: NIL

UNIT - I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory: Derivation of electrical conductivity and Thermal conductivity – Wiedemann-Franz law – Success and failures – Quantum free electron theory: Fermi–Dirac statistics – Density of energy states – Electron in periodic potential (Zone theory): Bloch theorem – Energy bands in solids – metals and insulators – tight binding approximation – Electron effective mass – concept of hole.

UNIT - II SEMICONDUCTOR PHYSICS 9

Properties of semiconductors **–** Energy band diagram – Direct and indirect semiconductors – Intrinsic Semiconductors – Carrier concentration (Derivation) – Variation of Fermi level with temperature **–** Extrinsic semiconductors **–** Carrier concentration in N-type & P-type semiconductors (qualitative) – Variation of Fermi level with temperature and carrier concentration **–** Carrier transport: drift and diffusion transport – Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions – Ohmic contacts – tunnel diode – Schottky diode – MOS capacitor.

UNIT - III DIELECTRIC MATERIALS 9

Basic definitions – polarization processes – Frequency and temperature dependence of polarization – Internal field – Classius-mosotti relation (derivation) – Dielectric constant experiment **–** Relation between dielectric constant and Refractive index – dielectric loss – dielectric breakdown – High K dielectric – applications of dielectric (capacitor, transformer) – Ferro electricity and its applications.

UNIT - IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes – absorption, emission and scattering of light in metals, insulators and semiconductors (concepts only) - photocurrent in a p-n diode – Photo voltaic effect **–** solar cell and its types – LCD **–** LED – Organic LED – Laser diodes – Exciton – quantum confined stark effect.

UNIT - V NANO ELECTRONIC DEVICES 9

Quantum structures, Quantum confinement – Density of states in quantum well, quantum wire and quantum dot structures(qualitative) **–** Band gap of nanomaterials – Quantum size effect **–** Size dependence of fermi energy – Quantum dot laser **–** Coulomb blockade effect – single electron transistor (SET) **–** Magnetic semiconductor **–** Carbon nanotubes**:** types, properties and applications.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Differentiate classical, quantum electron theories and energy band theory.
- Discuss the properties of semiconductors with applications of the p-n junction and diodes.
- Explain dielectric properties of materials.
- Classify optical materials for Opto – electronic applications.
- Clarify the basic operations of p-n junction devices like solar cells, LED, LCD etc
- Explain different quantum structures, size effect and carbon nanotubes.

TEXT BOOKS:

1. B.K.Pandey and S.Chaturvedi, “Engineering Physics”, Cengage learning, 2013.
2. V.Rajendran, “Engineering Physics”, Tata Mc Graw-Hill Education, 2011
3. Charles Kittel, “Introduction to solid state Physics”, John Wiley & sons, 8th edition, 2015.

REFERENCES:

1. G.W. Hanson, “Fundamentals of nano electronics”, Pearson Education, 2009
2. B. Rogers, Adams and S. Pennathur, “Nanotechnology: Understanding Small Systems”, CRC Press, 2019
3. N. Garcia and A. Damask, “Physics for Computer Science Students”, Springer Verlag, 2012.

20CS201	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic C programming constructs
- To learn about usage of arrays and strings
- To understand the concepts of functions, pointers, structures and unions.
- To expose to file handling operations in C

PRE-REQUISITE: NIL

UNIT - I BASICS OF C PROGRAMMING **9**

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

UNIT - II ARRAYS AND STRINGS **9**

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

UNIT - III FUNCTIONS AND POINTERS **9**

Introduction to functions– Function prototype, function definition, function call, Built- in functions (string functions, math functions), Recursion, Example Program– Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions –Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers – Array of pointers, Example

Program– Sorting of names, Parameter passing– Pass by value, Pass by reference, Example Program– Swapping of two numbers and changing the value of a variable using pass by reference

UNIT - IV STRUCTURES AND UNIONS **9**

Structure – Nested structures, Pointer and Structures, Array of structures, Example Program – using structures and pointers, typedef, Self referential structures, Union, Dynamic memory allocation, Illustrative programs – allocating block of memory, sum of n numbers using malloc, calloc.

UNIT - V FILE PROCESSING **9**

Files – File operations, Types of file processing– Sequential access, Random access Sequential access file - Example Program– Finding average of numbers stored in sequential access file, Random access file -Example Program– Transaction processing using random access files, Command line arguments.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Use basic constructs of C programming to develop simple programs.
- Analyze the one dimensional and two dimensional arrays and develop programs to implement operations such as addition, scaling, Determinant and Transpose.
- Utilize string operations such as length, compare, concatenate and examine sorting and searching algorithm.
- Illustrate simple examples for functions and pointers and develop programs to implement pointer arithmetic, arrays with pointers and advanced concepts of functions.
- Illustrate simple programs for structures and unions and design real time application programs
- Analyze file operations and develop programs to implement various file access procedures.

TEXT BOOKS:

1. Balagurusamy, E, “Programming in ANSI C”, Eighth Edition, Tata Mcgraw-Hill, 2019.
2. Yashavant Kanetkar, “Let Us C”, BPB Publications, 17th Edition, 2020.
3. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.

REFERENCES:

1. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Education India, 2015.
2. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd., 2011.
3. PradipDey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.
4. Byron Gottfried, "Schaum’s outlines- Programming with C", McGraw-Hill Education, Fourth edition, 2018.
5. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.

20EE201	ELECTRIC CIRCUIT ANALYSIS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To impart knowledge on solving A.C and D.C Circuits using various laws and theorems.
- To familiarize the concepts of resonance circuits and coupled circuits.
- To educate on obtaining the transient response of circuits.
- To introduce Phasor diagrams and analysis of three phase circuits.

PRE-REQUISITE: NIL

UNIT - I BASIC CIRCUITS ANALYSIS 12

Ohm's Law – Kirchoff's law – D.C and A.C circuits, Resistors in series and parallel circuits-Voltage and current division rule– Mesh current and node voltage - analysis in DC and AC circuits-average and R.M.S value, Phasor diagram, Power and Power Factor

UNIT - II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 12

Network reduction: source transformation – star- delta and delta-star transformation, Thevenin's theorem-Norton Theorems – Superposition Theorem –– Reciprocity Theorem – Maximum power transfer theorem – Millman's theorem

UNIT - III RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance – frequency response – Quality factor and Bandwidth - Self and mutual inductance –Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT - IV TRANSIENT RESPONSE ANALYSIS 12

Transient response of series RL, RC and RLC Circuits for DC input and A.C. sinusoidal input.

UNIT - V THREE PHASE CIRCUITS 12

Three phase balanced / unbalanced voltage sources - Analysis of three phase 3-wire and 4-wire circuits-three phase balanced star and delta connected load-three phase unbalanced star and delta connected load–phasor diagram of voltage, current and power measurement in three phase circuits.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply Kirchhoff's current and voltage laws to simple circuits and Solve complex circuits using Mesh & Nodal Methods.
- Apply source transformation techniques for analysis of electrical circuit.
- Apply Network theorems to linear circuits and to solve simple and complex problems.
- Compute the frequency response of Series and Parallel resonance and analyze tuned circuits.
- Analyze the Transient response of RLC circuits under DC and AC excitation using Laplace Transform.
- Analyze three phase balanced and unbalanced star, delta network.

TEXT BOOKS:

1. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.
2. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, McGraw Hill publishers, edition, New Delhi, 2013.
3. Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, 2013.

REFERENCES:

1. Chakrabarti A, “Circuits Theory (Analysis and synthesis), DhanpathRai& Sons, New Delhi, 2017.
2. Jegatheesan, R., “Analysis of Electric Circuits,” McGraw Hill, 2015.
3. Joseph A. Edminister, MahmoodNahri, “Electric circuits”, Schaum’s series, McGraw-Hill, New Delhi, 2010.
4. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.

20CS2L1	C PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

PRE-REQUISITE: NIL

LIST OF PROGRAMS

1. Programs using I/O statements, expressions and decision-making constructs
2. Program for finding given year is leap year or not and finding given number is Armstrong number or not.
3. Design a calculator to perform the operations namely, addition, subtraction, multiplication, division and square of a number.
4. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the
   following conditions.
   - 5 if it is a perfect cube.
   - 4 if it is a multiple of 4 and divisible by 6.
   - 3 if it is a prime number.

   Sort the numbers based on the weight in the increasing order as shown below
   <10,its weight>,<36,its weight><89,its weight>
5. Matrix addition and subtraction
6. Matrix multiplication and transpose of a matrix
7. Program using string with and without using string functions: string copy and Reverse the String.
8. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
9. From a given paragraph perform the following using built-in functions:
   a. Find the total number of words.
   b. Capitalize the first word of each sentence.
   c. Replace a given word with another word.
10. Program using recursion – factorial and Fibonacci series
11. Sort the list of numbers using pass by reference.
12. Generate salary slip of employees using structures and pointers.
13. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
14. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
15. **Mini project (Any one project : Maximum 4 per Team)**
    - Railway reservation system
    - Library Management System
    - University Result Publication System
    - Hospital Management System
    - Student Automation System
    - Payroll System
    - Banking System
    - Inventory System

PLATFORM NEEDED: Turbo C++ Compiler

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Develop simple programs using decision making and looping statements.
- Utilize array concepts to perform matrix addition, subtraction and multiplication.
- Utilize string operations and develop programs to show string copy and reverse.
- Develop programs using user defined functions, built-in functions and recursion.
- Design applications using sequential and random access files.
- Design simple real time projects using the concepts of structures and union.

20EE2L2 ELECTRIC CIRCUITS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To simulate various electric circuits using circuit simulation software.
- To gain practical experience on electric circuits and verification of theorems.
- To familiarize the concepts of resonance and coupled circuit experimentally.

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS:

1. Simulation and experimental verification of electrical circuit problems using Ohm's law, Kirchoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Simulation and experimental verification of Reciprocity theorem.
7. Simulation and experimental determination of time constant of RL and RC series circuits.
8. Study of measurement of self and mutual inductance.
9. Design and Simulation of series & parallel resonance circuit.
10. Simulation of three phase balanced and unbalanced star, delta network.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply Kirchhoff's voltage and current laws to solve simple and complex circuits.
- Apply network theorems to solve simple and complex circuits.
- Determine the Time Constant of RC and RL series circuit.
- Measure self, mutual inductance of a coil.
- Design and simulate series and parallel resonance circuit.
- Design and simulate three phase balanced and unbalanced star, delta network.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Regulated Power Supply: 0 – 15 V D.C - 10 Nos.
2. Function Generator (1 MHz) - 10Nos.
3. Self and Mutual inductance measurement kit – 2 Nos.
4. 10 Nos. of PC with Circuit Simulation Software (min 10 Users) (e-Sim /Scilab/ Pspice / MATLAB /other Equivalent software Package) and Printer (1No.)
5. AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10Nos.)
6. Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
7. Circuit Connection Boards - 10 Nos.
8. Oscilloscope (20 MHz) – 5 Nos.
9. Digital storage Oscilloscope (20MHz)-1No.

Necessary Quantities of Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10 Watt)

20BS301	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To make the student familiar with the topics such as Fourier Transforms, Z-Transforms and Fourierseries.
- To learn the formation of partial differential equations and the solution of first order and higher orderpartial differential equations.
- To apply Fourier series to solve one dimensional wave, one and two dimensional heat equations which occur frequently in various branches of engineering disciplines.

PRE-REQUISITE: NIL

UNIT - I PARTIAL DIFFERENTIAL EQUATIONS 12

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

UNIT - II FOURIER SERIES 12

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

UNIT - III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT - IV FOURIER TRANSFORMS 12

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

UNIT - V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Solve the given standard type of first order partial differential equations.
- Solve linear partial differential equation of second and higher order with constant coefficients.
- Solve differential equations using Fourier series analysis.
- Analyze the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equation problems.
- Compute the Fourier transforms of various functions.
- Apply Z-transforms techniques for discrete time systems.

TEXT BOOKS:

1. Grewal .B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2017.
2. Bali.N.P. and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Pvt. Ltd, 9th Edition, 2014.

REFERENCES:

1. Erwin Kreyszig, "Advanced Engineering Mathematics ", John Wiley, India, 8th Edition, 2016.
2. James.G., "Advanced Modern Engineering Mathematics", Pearson Education, 3rd Edition, 2007.
3. Andrews.L.C., L.C and Shivamoggi .B, "Integral Transforms for Engineers",SPIE Press, 1999.
4. Narayanan.S., Manicavachagom Pillay.T.K. and Ramanaiah.G, "Advanced Mathematics for Engineering Students", S.Viswanathan Publishers Pvt. Ltd, Chennai, Vol. II 2003 & Vol.III 2002.
5. Ramana.B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.

20EE301	DIGITAL LOGIC CIRCUITS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study various number systems and basic theorems of Boolean algebra and gate level minimization and implementation.
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
- To analyze and design of sequential circuits: synchronous and asynchronous circuits.
- To introduce the concept of synchronous sequential circuits, PLCs and Digital Logic Families.
- To introduce digital simulation techniques for development of application oriented logic circuit.

PRE-REQUISITE: NIL

UNIT - I BOOLEAN ALGEBRA AND GATE LEVEL MINIMIZATION 9

Review of number systems, types and conversion, binary codes, error detection and correction codes (Parity and Hamming code). Boolean theorems and properties – Boolean functions - Logic gates – Gate Level Minimization using Karnaugh Map, SOP & POS simplification, Don't Care conditions. Implementations of Logic Functions using gates-NAND–NOR implementations.

UNIT - II COMBINATIONAL LOGIC 9

Design of adders, subtractors, Multiplexers - Combinational logic design using Multiplexers - Demultiplexers and their use in combinational logic design - Magnitude comparators, Code Converters - BCD to Binary and Binary to BCD, Priority Encoders - Decimal to BCD, Octal to Binary, Decoders- BCD to Decimal and BCD to Seven Segment Display driver.

UNIT - III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential logic - SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Mealy models- Counters, state diagram; state reduction; state assignment

UNIT - IV ASYNCHRONOUS SEQUENTIAL CIRCUITS, MEMORY AND LOGIC FAMILIES 9

Asynchronous sequential logic circuits - Transition stability, flow stability - race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits. Memories: PROM, PLA – PAL, CPLD -FPGA. Digital Logic Families: TTL, ECL, CMOS.

UNIT - V VHDL 9

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De multiplexers).

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Convert different types of codes and the various types of number system, simplify the Boolean functions and gate level minimization and implementation

- Apply K –Map for simplification and implementation of combinational logic circuit
- Design the synchronous Sequential logic circuits, draw the block diagram of Shift Registers and Counters.
- Analyze the asynchronous sequential circuits and explain the hazards & errors in digital circuits.
- Describe the operation of Programmable Logic Devices and digital logic families
- Design the VHDL coding for combinational logic and Sequential circuits.

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog" Pearson India, 6th Edition, 2018.
2. Comer "Digital Logic & State Machine Design, Oxford, 3rd Edition, 2016.
3. Thomas L Floyd "Digital Fundamentals" 11th edition, Pearson Education, 2015

REFERENCES:

1. James W. Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. D.P.Kothari, J.S.Dhillon "Digital Circuits and Design" Pearson Education, 2016
3. Mandal, "Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
4. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson,2013
5. Raj Kamal "Digital Systems – Principles and Design" Pearson Education India, 2012.

20EE302	ELECTRON DEVICES AND CIRCUITS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the structure of basic electronic devices.
- Be exposed to active and passive circuit elements.
- To familiarize the operation and applications of electronic devices.
- To explore the gain Vs frequency response characteristics of amplifier.
- To learn the required functionality of positive and negative feedback systems.

PRE-REQUISITE:

Course Code: 20BS203 & 20EE201
Course Name: Physics for Electronics Engineering & Electric Circuit Analysis

UNIT - I PN JUNCTION DEVICES 9

PN junction diode – structure, operation and V-I characteristics, Transition and Diffusion capacitances – Rectifiers – Half Wave and Full Wave Rectifier. Zener diode – reverse characteristics – Zener as voltage regulator, Display devices – LED, Laser diode.

UNIT - II BJT AND SMALL SIGNAL AMPLIFIERS 9

BJT - structure, operation of NPN and PNP transistor, Input and output characteristics of CE, CB and CC configurations. DC Load Line and operating point, Need for biasing - Fixed and Voltage divider biasing. Single stage BJT amplifiers – AC analysis of CE amplifier with Voltage divider bias using h-parameters - Gain and frequency response.

UNIT - III FIELD EFFECT TRANSISTORS AND THYRISTORS 9

JFET, MOSFET - structure, operation and characteristics, Biasing - self and voltage divider biasing. FET small signal model - Analysis of CS and Source follower. Thyristor - SCR operation and characteristics, UJT - operation and characteristics.

UNIT - IV DIFFERENTIAL AMPLIFIERS AND LARGE SIGNAL AMPLIFIERS 9

Cascade amplifier, BJT Differential amplifier – DC and AC analysis of common mode gain, differential mode gain and CMRR - Single tuned amplifier - construction, operation and frequency response. Power amplifiers – class A, class B and class C (Qualitative analysis).

UNIT - V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Feedback concepts, feedback connections - voltage / current, series / shunt feedback - Transfer gain with feedback - effect of negative feedback on R_i and R_o - Advantages of negative feedback. Positive feedback – Condition for oscillations, RC phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the operation and characteristics of PN junction diode, Zener diode, LED and Laser diode.
- Derive the expression for voltage gain, current gain, input resistance and output resistance of a BJT CE amplifier with voltage divider biasing using h-parameter model.
- Derive the expression for voltage gain, input resistance and output resistance of FET amplifier under CS and Source follower connection.

- Explain the operation of cascade amplifier, differential amplifier, single tuned amplifier and power amplifier.
- Derive the expression for gain with feedback, input resistance and output resistance of different negative feedback connections.
- Determine the oscillating frequency of RC and LC tuned Oscillators for a specific application.

TEXT BOOKS:

1. David A. Bell, “Electronic Devices and Circuits”, Oxford University press higher education, 5th Edition,2008.
2. Sedra and smith, “Microelectronic circuits”, 8th Ed., Oxford University Press 2020.
3. Jacob Millman, Christos C Halkias, Satyabrata Jit, ‘Electronic Devices and circuits’, McGraw Hill education, 4th edition, 2015.

REFERENCES:

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2nd Edition 2014
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2003
4. Robert Boylestad and Louis Nashelsky., “Electron Device and Circuit Theory” Prentice Hall PrivateLimited, 11th edition, 2017.
5. S Salivahanan, N Suresh Kumar, “Electronic Devices and Circuits”, McGraw Hill Education (India)Private Limited, 4th Edition, 2017.
6. Sedha R.S, “A Text Book of Applied Electronics”, S. Chand & company Ltd., Revised edition, 2013.

20EE303	ELECTROMAGNETIC THEORY	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of
  - Electrostatic fields, electrical potential, energy density and their applications.
  - Magneto static fields, magnetic flux density, vector potential and its applications.
  - Different methods of emf generation and Maxwell's equations
  - Electromagnetic waves and characterizing parameters

PRE-REQUISITE:

Course Code: 20BS101, 20BS201 & 20EE201
Course Name: Fundamentals of Engineering Mathematics, Laplace Transform and Advanced Calculus & Electric Circuit Analysis

UNIT - I VECTOR CALCULUS 12

Review of Vector algebra - Introduction to Cartesian, Cylindrical and Spherical coordinate systems - Vector calculus - Differential length, area and volume, line, surface and volume integrals - Del operator - Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem - Laplacian of a scalar.

UNIT - II STATIC ELECTRIC FIELDS 12

Coulomb's law - Electric field intensity - Electrical field due to point, Line, Surface and Volume charge distributions - Gauss law and its applications - Absolute Electric potential - Potential difference - Calculation of potential differences for different configurations - Electric dipole - Electrostatic Energy and Energy density - Current and current density - Continuity of current - Boundary conditions of perfect dielectric materials - Permittivity of dielectric materials - Capacitance, Capacitance of different configurations - Poisson's and Laplace's equation - Applications.

UNIT - III STATIC MAGNETIC FIELDS 12

Biot-Savart's Law – Ampere's Circuital Law - Steady magnetic fields produced by current carrying conductors – Magnetic flux and magnetic flux density Scalar and Vector Magnetic potentials Lorentz Force - Magnetic Force and Torque - Nature of magnetic materials - Magnetization and permeability - Magnetic boundary conditions - Magnetic circuits - Inductances and Mutual inductances - Energy density - Applications.

UNIT - IV TIME VARYING FIELDS 12

Faraday's law for Electromagnetic induction- Motional and Transformer EMF- Displacement current, Point form and Integral form of Maxwell's equation- Maxwell's equation in Phasor form - Applications.

UNIT - V ELECTROMAGNETIC WAVES 12

Derivation of Wave Equation - Uniform Plane Waves - Wave equation in Phasor form - Plane waves in lossy dielectrics - Plane waves in free space and in a homogenous material - Wave equation for a conducting medium-Propagation in good conductors - Skin effect - Poynting theorem - Reflection and Refraction of Uniform plane waves - Standing wave ratio - Applications.

TOTAL: 60 PERIODS

-

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Apply the vector calculus to static electromagnetic fields.
- Apply the principles of electrostatics related to electric field.
- Apply the principles of electrostatics related to electric potential.
- Apply the principles of magneto statics related to magnetic field.
- Apply Maxwell‘s equations in differential and integral forms.
- Apply Maxwell‘s equations to uniform plane wave propagation in different media.

TEXT BOOKS:

1. Mathew N. O. Sadiku, ‘Principles of Electromagnetics’, 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, ‘Engineering Electromagnetics’, McGraw Hill Special Indian edition, 2014.
3. K A Gangadhar, ‘Electromagnetic Field Theory’, Khanna Publishers; Eighth Reprint : 2015

REFERENCES:

1. Joseph. A.Edminister, ‘Schaum’s Outline of Electromagnetics, Third Edition (Schaum’s Outline Series), McGraw Hill, 2010.
2. Kraus and Fleish, ‘Electromagnetics with Applications’, McGraw Hill International Editions, Fifth Edition, 2010.
3. J.P.Tewari, ‘Engineering Electromagnetics - Theory, Problems and Applications’, Second Edition, Khanna Publishers,2013

20EE304	ELECTRICAL MACHINES – I	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To understand the Constructional details, the principle of operation, types, performance characteristics and applications of DC generator.
- To understand the Constructional details, the principle of operation, types, performance characteristics and applications of DC motor.
- To explain the need for starters, types and its operation of DC motor and to explain the various methods of testing of DC machines.
- To understand the Constructional details, the principle of operation, types, performance characteristics and applications of Transformer.
- To explain the various types of testing of single phase transformer and types of three phase transformer connections.

PRE-REQUISITE:

Course Code: 20EE201
Course Name: Electric Circuit Analysis

UNIT - I DC GENERATOR 12

Constructional Details – Working Principle – Types of Armature Winding and Connections – EMF Equation – Methods of Excitation – Characteristics of Series, Shunt and Compound Generators – Armature Reaction and Commutation – Parallel Operation – Losses, Efficiency and Power Stages in DC Generator – Condition for Maximum Efficiency – Applications

UNIT - II DC MOTOR 12

Principle of Operation – Back EMF – Maximum output power - Torque Equation – Types of DC Motor – Characteristics of Series, Shunt and Compound Motor – Losses, Efficiency and Power Stages in DC Motor – Condition for Maximum Efficiency - Applications.

UNIT - III STARTERS, SPEED CONTROL AND TESTING OF DC MACHINES 12

Need of starters – two point, three point, four point starters – Speed Control Methods – Separation of No Load Losses – Testing of DC Machines – Brake Test, Swinburne‘s Test, Retardation Test and Hopkinson‘s Test. Electric braking – Plugging, dynamic and regenerative braking.

UNIT - IV TRANSFORMER 12

Constructional Details – Principle of Operation - Types – EMF Equation – Transformation Ratio – Phasor Diagram – Transformer on No Load and Load – Equivalent Circuit – OC and SC Test – Regulation – Parallel Operation – Auto Transformer – Saving of Copper.

UNIT - V TESTING OF TRANSFORMER 12

Losses and Efficiency in Transformers – Condition for Maximum Efficiency – Testing of Transformers – Polarity Test, Load Test – Phasing out Test – Sumpner’s Test – Separation of Losses – All day Efficiency – Three Phase Transformers – Types of Connections.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Calculate the required filed turns and brush adjustment to compensate the armature reaction and explain the construction and working of D.C generator.
- Analyze the characteristics of D.C motor to identify its applications based on requirement

- Calculate the required resistance to minimize the starting current of D.C motor and to predetermine the efficiency of d.c machine in different methods
- Explain the construction and working of transformer for different loading condition with required phasor diagram.
- Analyze the conversion of two winding transformer into auto transformer for different connection and to calculate increase in efficiency and cost saving
- Calculate the efficiency of distribution transformer by direct loading and indirect loading

TEXT BOOKS:

1. Nagrath.I. J and Kothari. D. P., 'Electric Machines', 5th Edition, Tata McGraw Hill Publishing Company,New Delhi, 2017.
2. P.C Sen, 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd edition 2013.
3. Stephen J. Chapman, 'Electric Machinery fundamentals', 4th edition, McGraw Hill education Pvt. Ltd, 2010.
4. M G Say, 'Alternating Current Machines', 4th edition, Pitman Publishing Limited, 1976.

REFERENCES:

1. Bimbra P.S. - Electrical Machinery, 1st Edition, Khanna Book Publishing co(P) Ltd, New Delhi, 2021
2. S.K. Bhattacharya, 'Electric Machines' McGraw - Hill education, New Delhi, 3rd edition, 2009.
3. Theodore Wildi., 'Electrical Machines, Drives and Power Systems', Pearson education, (5th Edition), 2002.
4. Sahdev. S.K., 'Electrical Machines', Cambridge University Press, 2018.

20HS301	UNIVERSAL HUMAN VALUES	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

PRE-REQUISITE: NIL

UNIT - I INTRODUCTION TO VALUE EDUCATION **9**

Value Education – Definition - Concept and Need for Value Education - The Evolution of Value Education: Natural acceptance, Self exploration - Fundamentals of value education - Happiness and Prosperity as parts of Value Education- fulfilling human aspirations.

Practice sessions: To discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT - II HARMONY IN THE HUMAN BEING **9**

Human being vs Value education - I' and Body synchronization - Understanding Myself as Co-existence of the Self and the Body - Realization - Self, Body needs - Scanning of Karma - Self and Body- Understanding Sanyam and Health.

Practice sessions: To discuss the role others have played in making material goods available to self. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT - III HARMONY IN THE FAMILY, SOCIETY AND NATURE **9**

Family as a basic unit of Human Interaction-Values in Relationships - The Basics for Trust and Respect in today's Crisis: Affection, e-Guidance, Reverence, Glory, Gratitude and Love – Harmony in society : Resolution, Prosperity, Fearlessness and Co-existence as Comprehensive Human Goal- Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

Practice sessions: To discuss on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education. Gratitude as a universal value in relationship. Discuss with scenarios. Elicit examples from students' lives

UNIT - IV : SOCIAL ETHICS **9**

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Order - Universal Human Order and Ethical Conduct - Human Rights violation and Social Disparities.

Practice sessions: To discuss human being as cause of imbalance in nature, pollution, depletion of resources and role of technology

UNIT - V PROFESSIONAL ETHICS **9**

Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies, Production System and Management Models.

Practice sessions: To discuss the conduct as an engineer or scientist.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the significance of value inputs in a classroom and start applying them in their life and profession
- Distinguish between Values & Skills to ensure happiness and prosperity.
- Distinguish between Thyself & the Body to ensure competency of an individual.
- Explain the role of a human being in ensuring harmony in society and nature.
- Distinguish between ethical and unethical practices, and apply suitable strategy to actualize a harmonious working environment.
- Develop an awareness of human values to appreciate the rights of others.

TEXT BOOKS:

1. R.R. Gaur, R. Asthana, G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd revised edition, Excel Books, New Delhi, Reprint 2019.
2. A N Tripathy, Human Values, New Age International Publishers, New Delhi, 2003.

REFERENCES:

1. E G Seebauer & Robert L.Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
2. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd, Reprint 2011.
3. Mike Martin and Roland Schinzinger “Ethics in Engineering” McGraw Hill, New York, 4th edition, Reprint 2017.
4. Charles E. Harries, Michael S. Protchard and Michael J. Rabins, “Engineering Ethics-concepts and Cases”, Thomson Learning, 2000.
5. S.K. Chakraborty and Dabangshu Chakraborty, “Human Values and Ethics: Achieving Holistic Excellence”, ICFAI University Press, 2006.

20EE3L1	ELECTRONICS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand the behavior of semiconductor devices experimentally.
- To design the amplifiers and oscillators.
- To analyze the rectifier and filters

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS:

1. Characteristics of Semiconductor diode.
2. Characteristics of Zener diode and Zener as series voltage regulator.
3. Realization of passive filters.
4. Single Phase half-wave and full wave rectifiers with capacitive filters.
5. Characteristics of a BJT under common emitter and common base configurations.
6. Design and testing of Common Emitter amplifier.
7. Characteristics of UJT and generation of saw tooth waveforms.
8. Characteristics of JFET.
9. Differential amplifier using FET.
10. Design and testing of RC phase shift and LC oscillators.
11. Design and testing of Feedback amplifiers (Any one)
12. Simulation of rectifier circuits using PSIM/SIMULINK

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Determine the Breakdown voltage, forward and reverse resistance of PN junction diode and Zener diode and calculate the ripple factor of rectifier circuits with filter.
- Calculate the hybrid parameters of BJT CE and CB configuration from their characteristics.
- Obtain the frequency response of BJT CE amplifier, feedback amplifier and calculate its bandwidth.
- Obtain the UJT and JFET parameters from the characteristics and also to calculate the gain of differential amplifier using JFET.
- Design the RC and LC tuned oscillators for a specific oscillating frequency.
- Analyze the input and output performance of the given diode based circuit using simulation tools.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Semiconductor devices like Diode, Zener Diode, NPN Transistors	Sufficient
2	JFET, UJT	Sufficient
3	Resistors, Capacitors and inductors	Sufficient
4	Function Generators	10 Nos.
5	Regulated Power Supply ± 15V	10 Nos.
6	CRO	10 Nos.
7	Storage Oscilloscope	1 No.
8	Bread boards	Sufficient
Atleast one demo kit for the listed experiment.		

20EE3L2 ELECTRICAL MACHINES LABORATORY – I

L	T	P	C
0	0	3	1.5

OBJECTIVES:

- To analyze the characteristics of D.C motor and D.C generator under actual load test.
- To analyze the characteristics of D.C motor and D.C generator by indirect method
- To analyze the characteristics of transformer by direct and indirect method

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS:

1. Load test on DC Shunt motor & Load test on DC Series motor (Software/Hardware).
2. Load characteristics of DC compound generator.
3. Load test on DC Compound motor (Software/Hardware).
4. Speed Control of DC Motor: Field control, Armature control.
5. Swinburne's test.
6. Open circuit and Load characteristics of DC generator (Self and Separately Excited).
7. Load test on DC series generator.
8. Hopkinson's test.
9. Load test on single phase transformer and Three phase transformer connections.
10. Open circuit & Short circuit test on single phase transformer
11. Sumpner's test.
12. Performance analysis of BLDC motor (MODROB Equipment)

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Select a D.C machine for an application based on the required characteristics
- Examine the D.C machine to determine and predetermine the performance characteristics
- Explain the different speed control of D.C machines
- Analyze the performance characteristics of transformer by direct method.
- Estimate the transformer parameters by indirect method.
- Examine the losses in transformer for various load condition and to find efficiency.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No.	NAME OF THE EQUIPMENT	Qty.
1.	DC Shunt Motor with Loading Arrangement	3 Nos.
2.	Single Phase Transformer	4 Nos.
3.	DC Series Motor with Loading Arrangement	1 No.
4.	DC compound Motor with Loading Arrangement	1 No.
5.	DC Shunt Motor Coupled With DC Compound Generator	2 Nos.
6.	DC Shunt Motor Coupled With DC Shunt Motor	1 No.
7.	Tachometer -Digital/Analog	8 Nos.
8.	Single Phase Auto Transformer	2 Nos.
9.	Three Phase Auto Transformer	1 No.
10.	Single Phase Resistive Loading Bank	2 Nos.

20BS402	NUMERICAL METHODS	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To introduce the basic concepts to Solving Algebraic and Transcendental Equations.
- To make the Student familiarize with the Concept of Numerical Techniques of Interpolation,Differentiation and Integration.
- To understand the various Techniques and Methods of Solving Ordinary Differential Equations andPartial Differential Equations.

PRE-REQUISITE: NIL

UNIT - I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of Algebraic and Transcendental Equations - Fixed Point Iteration Method – Newton Raphson Method - Solution of Linear System of Equations - Gauss Elimination Method – Pivoting - Gauss Jordan Method – Iterative Methods of Gauss Jacobi and Gauss Seidel – Eigen Values of a Matrix by Power Method and Jacobi's Method for Symmetric Matrices.

UNIT - II INTERPOLATION AND APPROXIMATION 12

Interpolation with Unequal Intervals - Lagrange's Interpolation – Newton's Divided Difference Interpolation – Cubic Splines - Difference Operators and Relations - Interpolation with Equal Intervals - Newton's Forward andBackward Difference Formulae.

UNIT - III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of Derivatives using Interpolation Polynomials - Numerical Integration using Trapezoidal, Simpson's 1/3 Rule – Romberg's Method - Two point and Three point Gaussian Quadrature Formulae – Evaluation of Double Integrals by Trapezoidal and Simpson's 1/3 Rules.

UNIT - IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single Step Methods - Taylor's Series Method - Euler's Method - Modified Euler's Method - Fourth Order Runge - Kutta Method for Solving First Order Equations - Multi Step Methods - Milne's and Adams – Bash Forth Predictor Corrector Methods for Solving First Order Equations.

UNIT - V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite Difference Methods for Solving Second Order Two - Point Linear Boundary Value Problems - 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: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Solve Algebraic and Transcendental equations.
- Apply Newton's forward, backward and Lagrange's formula for interpolation with equal and unequal intervals.

- Compute derivatives using Newton's forward and backward interpolation formulae.
- Apply Numerical Integration for Single Variable and Two Variable Functions.
- Solve Initial Value Problem using Single Step and Multi Step Methods.
- Solve the Boundary Value Problem using Finite Difference Methods.

TEXT BOOKS:

1. Grewal.B.S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, 10th Edition, 2015.
2. Sastry. S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt.Ltd, 5th Edition, 2018.

REFERENCES:

1. Burden.R.L and Faires.J.D, "Numerical Analysis", Cengage Learning, 9th Edition,2016.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, New Delhi, 7th Edition, 2006.
3. Mathews. J.H. "Numerical Methods for Mathematics, Science and Engineering",Prentice Hall, 2nd Edition, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 5th Edition, New Delhi, 2007.
5. Veerarajan.T, Ramachandran. T, "Numerical Methods With Programs In C", Tata Mcgraw Hill Publishing Company Limited, 8th Edition, Reprint 2011.

20EE401	ELECTRICAL MACHINES - II	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To learn the construction and performance of salient and non – salient type synchronous generators.
- To analyze the operation and performance of synchronous motor.
- To learn the construction, principle of operation and performance of induction machines.
- To learn the starting and speed control of three-phase induction motors.
- To analyze the operation and performance of single phase induction motors and special machines.

PRE-REQUISITE:

Course Code: 20EE201, 20EE303 & 20EE304
Course Name: Electric Circuit Analysis**,** Electromagnetic Theory & Electrical Machines – I.

UNIT - I SYNCHRONOUS GENERATOR 12

Constructional Details – Types of Rotors – EMF Equation – Synchronous Reactance – Armature Reaction – Voltage Regulation – EMF, MMF and ZPF Methods – Synchronizing and Parallel Operation – Synchronizing Power - Power Output Equations - Change of Excitation and Mechanical Input.

UNIT - II SYNCHRONOUS MOTOR 12

Principle of Operation – Torque Equation – Starting Methods -Operation on Infinite Bus bars – V and Inverted V Curves – Input and Output Power Equations – Power Angle Relations – Hunting - Synchronous Condenser - Applications.

UNIT - III THREE PHASE INDUCTION MOTOR 12

Constructional Details – Types of Rotors – Squirrel Cage and Slip Ring – Principle of Operation – Slip –Torque Equations -Slip-Torque Characteristics – Losses and Efficiency – Load Test - No Load and Blocked Rotor Tests - Equivalent Circuit- Circle Diagram – Separation of No Load Losses – Crawling and Cogging – Double Cage Rotors – Induction Generator.

UNIT - IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 12

Need for Starters – Types of Starters – Stator Resistance, Rotor Resistance, Autotransformer, Star-Delta Starters and DOL Starters - Speed Control by Varying Voltage, Frequency, Poles and Rotor Resistance – Slip Power Recovery Scheme.

UNIT - V SINGLE PHASE INDUCTION MOTOR AND SPECIAL MACHINES 12

Constructional Details –Types of single phase motors– Double Revolving Field Theory – No Load and Blocked Rotor Tests - Equivalent Circuit – Starting Methods – Applications. Special machines – Linear Induction Motor, Hysteresis motor, Brushless DC Motor.

TOTAL: 60 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Calculate the Voltage regulation of Synchronous generator in Different methods and explain the construction details of alternator.

- Analyze the sharing of Real and Reactive power in Parallel operation and explain the V and Inverted V curve of Synchronous machine.
- Analyze the torque-slip characteristics and explain the construction and working principle of three phase induction motor.
- Analyze the efficiency of three phase induction motor for different slip using equivalent circuit.
- Compare and calculate the starting torque and current of three phase induction motor for different starters and Explain the speed control of three phase induction motor.
- Calculate the efficiency for different slip using equivalent circuit and explain the construction and working principle of single phase induction motor

TEXT BOOKS:

1. Nagrath.I. J and Kothari. D. P., 'Electric Machines', 5th Edition, Tata McGraw Hill Publishing Company,New Delhi, 2017.
2. P.C Sen, 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd edition 2013.
3. Stephen J. Chapman, 'Electric Machinery fundamentals' 4th edition, McGraw Hill education Pvt. Ltd, 2010.
4. M G Say, 'Alternating Current Machines', 4th edition, Pitman Publishing Limited, 1976.

REFERENCES:

1. Bimbra P.S. - Electrical Machinery, 1st Edition, Khanna Book Publishing co(P) Ltd, New Delhi, 2021
2. S.K. Bhattacharya, 'Electric Machines' McGraw - Hill education, New Delhi, 3rd edition, 2009.
3. Theodore Wildi., 'Electrical Machines, Drives and Power Systems', Pearson education, (5th Edition), 2002.
4. Sahdev. S.K., 'Electrical Machines', Cambridge University Press, 2018.

20EE402	TRANSMISSION AND DISTRIBUTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the structure of electric power system and to develop expressions for the Computation of transmission line parameters
- To obtain the equivalent circuits for the transmission lines based on distance and to determine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze the voltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS

PRE-REQUISITE:

Course Code: 20EE201 & 20EE303
Course Name: Electric Circuit Analysis & Electromagnetic Theory

UNIT - I TRANSMISSION LINE PARAMETERS 9

Structure of Power System - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT - II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line – equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation, real and reactive power flow in lines – Power Circle diagrams -Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT - III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT - IV UNDER GROUND CABLES 9

Underground cable - Types of cables – Construction of single core and 3 core Cables - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cables- Grading of cables - Power factor and heating of cables– DC cables.

UNIT - V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin's Law – AC distribution System – Connection schemes-radial and ring main-Interconnected system-Techniques of Voltage Control and Power factor improvement – Distribution Loss –Types of Substations - Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Calculate the transmission network parameters for various configuration.
- Predict the performance of transmission line.
- Calculate the sag of transmission line
- Calculate the voltage distribution in insulator strings and determine the string efficiency of insulator.
- Compute the electrical parameter of underground cable.
- Explain the types of distribution system.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Tata McGraw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2016.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd,New Delhi, Second Edition, 2011.

REFERENCES:

1. B.R.Gupta , "Power System Analysis and Design", S. Chand, New Delhi, Fifth Edition, 2011.
2. Soni M L, Gupta P V, Bhatnagar U S and Chakrabarthi A, "A Text Book on Power SystemEngineering", Dhanpat Rai & Co., New Delhi, 2016.
3. V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi, 2013

20EE403	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To discuss the IC fabrication procedure.
- To learn the characteristics of Op-Amp.
- To design and construct the basic applications of Op–amp.
- To interpret the internal functional blocks and the applications of special ICs.
- To illustrate the operation of application ICs.

PRE-REQUISITE:

Course Code: 20EE201 & 20EE302
Course Name: Electric Circuit Analysis & Electron Devices and Circuits

UNIT - I IC FABRICATION **9**

IC classification - fundamentals of monolithic IC technology – basic planar processes - fabrication of typical circuit - Fabrication of diodes, resistance, capacitance and FETs.

UNIT - II CHARACTERISTICS OF OP-AMP **9**

Ideal Op-Amp - DC and AC characteristics - Basic applications of Op-Amp – Inverting and Non-inverting Amplifiers, summer, differential amplifier, differentiator and integrator - V/I and I/V converters.

UNIT - III APPLICATIONS OF OP-AMP **9**

Op-Amp circuits using Diodes - peak detector, clippers, clampers - Instrumentation amplifier - S/H circuit – comparators - multivibrators - waveform generators – First order Low pass and high pass active filters - D/A converter (R- 2R ladder and weighted resistor types) - A/D converter (Flash and Successive approximation types).

UNIT - IV SPECIAL ICs **9**

555 Timer - Functional block, characteristics – IC NE/SE 566 Voltage Controlled Oscillator - IC NE/SE 565 Phase Locked Loop – AD633 Analog multiplier and Divider.

UNIT - V APPLICATION ICs **9**

IC voltage regulators – LM78XX, LM79XX series voltage regulator - LM317, 723 Variability voltage regulators – µA78S40 switching regulator - LM 380 power amplifier - ICL 8038 function generator IC.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Explain the IC fabrication process and discuss the fabrication of active and passive components.
- Compute the gain and output voltage of the given Op-Amp circuits.

- Determine the oscillating/cutoff frequency of waveform generators and filters and also discuss the operation of Op-Amp circuits using diodes.
- Discuss the internal functional blocks and applications of special ICs 555, 566, 565, and AD633 ICs.
- Explain the operation of voltage regulator ICs namely LM78XX, LM79XX, LM317 and LM723.
- Discuss the operation of μA78S40 switching regulator, LM 380 power amplifier and ICL 8038 function generator IC.

TEXT BOOKS:

1. David A. Bell, 'Operational Amplifiers and Linear ICs, Oxford higher education, 2013.
2. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuits", 5th Edition, New Age, 2018.
3. Ramakant A. Gayakward, "Op–Amps and Linear Integrated Circuits", 4th Edition, PHI, 2015.

REFERENCES:

1. Fiore, 'Opamps & Linear Integrated Circuits Concepts & applications', Cengage, 2018.
2. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition, 2012.
3. Muhammad H. Rashid, 'Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.
4. Floyd , Buchla, 'Fundamentals of Analog Circuits', Pearson, 2013.
5. Jacob Millman, Christos Halkias, Chetan D Parikh, 'Integrated Electronics – Analog and Digital circuits system', McGraw Hill, 2nd edition, 2017.
6. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill, 2016.

20EE404	MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the basic functional elements of instrumentation
- To introduce the fundamentals of electrical and electronic instruments
- To educate on the comparison between various measurement techniques
- To introduce various storage and display devices
- To introduce various transducers and the data acquisition systems.

PRE-REQUISITE:

Course Code: 20EE201
Course Name: Electric Circuit Analysis

UNIT - I INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

UNIT - II ELECTRICAL AND ELECTRONICS INSTRUMENTS 9

Classification of measuring instruments-Essential requirements of an instrument-Construction, working principle and Torque equation of Permanent Magnet Moving Coil instruments - Attraction type and Repulsion type Moving iron instruments-Electro-dynamometer type Wattmeter, Extension of Voltmeter and Ammeter range - Construction, working principle of Instrument transformers-1φ Induction type Energy meter.

UNIT - III COMPARISON METHODS OF MEASUREMENTS 9

D.C potentiometers - Crompton Potentiometer, D.C (Wheatstone, Kelvin, Kelvin double) bridges & A.C (Maxwell, Anderson, Hay's, Wein & Schering**)** bridges, transformer ratio bridges, self-balancing bridges.

UNIT - IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Elements of data acquisition system - Data Loggers.

UNIT - V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Selection of transducers – Resistive Transducer – Strain guage, Measurement of Temperature - RTD, thermister & thermocouple, Capacitive transducer - Inductive Transducers – Linear Variable Differential Transducer, Piezoelectric, Hall effect, optical and digital transducers –– Smart sensors-Thermal Imagers, Power factor meter - Harmonic analyzer - Spectrum analyzer

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Compute the different statistical analysis on errors.
- Explain the concepts of fundamentals of electrical and electronic instruments
- Classify AC and DC bridges and formulate balance equation to calculate unknown resistance, inductance and capacitance.

- Discuss the interference and classify grounding techniques.
- Explain the various storage and display devices.
- Explain the construction and working of different types of transducer.

TEXT BOOKS:

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2017.
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2018.
3. H.S. Kalsi, 'Electronic Instrumentation', McGraw Hill, 4th Edition 2019.

REFERENCES:

1. E.O. Doebelin, Dhanesh N Manik, 'Measurement Systems' 7th Edition, McGraw Hill publishing company, 2019.
2. R.K. Rajput, 'Electrical and Electronics Measurements and Instrumentation', S. Chand Publications, New Delhi, 4th Edition, 2016.
3. Alan. S. Morris, 'Measurement and Instrumentation: Theory and Application', Prentice Hall of India, 2nd Edition, 2015.
4. David Bell, 'Electronic Instrumentation & Measurements', Oxford University Press, 2013.
5. D.V.S. Murthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2015

20HS401	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To study the scope and significance of environment
- To study the interrelationship between living organism and environment
- To know about conservation of biodiversity
- To get a conceptual knowledge on various types of pollution
- To gain knowledge on various natural resources
- To provide knowledge on natural disasters and its management
- To learn social issues such as human welfare, sustainability related to population

PRE-REQUISITE: NIL

UNIT - I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 6

Environment – definition, importance, public awareness Ecosystem – concept, structure and function – producers, consumers and decomposers - characteristic features, structure and function of the forest ecosystem and grassland ecosystem. Biodiversity – definition, types - genetic, species and ecosystem diversity – values - consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife – endangered and endemic species of India – Assignment on conservation of biodiversity.

UNIT - II ENVIRONMENTAL POLLUTION 6

Definition, causes, effects and control measures of (i) Air pollution (ii) Water pollution (iii) Soil pollution (iv) Marine pollution – role of an individual in prevention of pollution – pollution case studies - Climate change - global warming, acid rain, ozone layer depletion.

UNIT - III NATURAL RESOURCES 6

Forest resources: Uses, over-exploitation, deforestation, case studies Water resources: Surface water and ground water - uses, over-utilization, conflicts over water, Conservation of water - rain water harvesting, dams-benefits and problems. Mineral resources: uses, over exploitation, environmental effects of extracting mineral resources, case studies.

UNIT - IV SOLID WASTE AND DISASTER MANAGEMENT 6

Solid waste management Introduction, types, effects on human beings and disposal management. Disaster management Introduction, causes, effects and management of flood, cyclone, earthquake, landslide disasters – case studies- roles and responsibilities of Government and community

UNIT - V HUMAN POPULATION AND SOCIAL ISSUES 6

Population growth, population explosion – family welfare programme – women and child welfare – human rights – value education – sustainable development – resettlement and rehabilitation – waste land reclamation – role of information technology in environment and human health. Debate on women and child welfare.

TOTAL: 30 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Describe the environment, ecosystem and their significances
- Identify the threats to biodiversity and methods to conserve biodiversity
- Identify and implement technological and economical solution to environmental pollution

- Develop the knowledge on various natural resources and effect on environment due to over utililization
- Record the consequences of natural disasters
- Outline the social issues such as welfare, sustainability etc., and to relate with population growth

TEXT BOOKS:

1. Anubha Kaushik and Kaushik C.P., Environmental Science and Engineering, New Age International (P) Ltd, Sixth Edition, 2018.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.

REFERENCES:

1. Erach Bharucha, “Text book of Environmental Studies”, Universities Press (I) PVT LTD, Hyderabad, 2015
2. G. Tyler Miller and Scott E.Spoolman, “Environmental Science”, Cengage Learning India PVT, LTD, Delhi, 2014
3. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 2nd edition, Pearson Education, 2004

20EE4L1	ELECTRICAL MACHINES LABORATORY – II	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To analyze the voltage regulation of synchronous machine in different methods
- To analyze the performance characteristics of three phase and single phase induction motor using equivalent circuit
- To analyze the characteristics of synchronous machines for various excitation

PRE-REQUISITE: NIL

LIST OF EXPERIMENTS:

1. Regulation of three-phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF method.
3. Load test on three-phase alternator.
4. V and inverted V curves of three phase synchronous motor.
5. Load test on three phase induction motor
6. No load and blocked rotor test on three phase induction motor.
7. Load test on single phase induction motor
8. Determination of equivalent circuit of single phase induction motor
9. Synchronization of three phase alternator with bus bar.
10. Separation of no-load losses of three-phase induction motor.
11. Measurement of starting current of AC motors with different starter using Power Quality Analyzer
12. Performance analysis of Synchronous Reluctance motor (MODROB equipment)

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Examine the given synchronous machine and to pre determine the voltage regulation by different methods.
- Calculate voltage regulation alternator by direct loading.
- Analyze the power factor of synchronous motor for various excitations.
- Calculate the efficiency by direct loading.
- Calculate the performance characteristics using equivalent circuit of single and three phase induction motor
- Analyze the constant losses induction motor for various frequency

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No.	NAME OF THE EQUIPMENT	Qty.
1.	Synchronous Induction motor 3HP	1 No.
2.	DC Shunt Motor Coupled With Three phase Alternator	4 Nos.
3.	DC Shunt Motor Coupled With Three phase Slip ring Induction motor	1 No.
4.	Three Phase Induction Motor with Loading Arrangement	2 Nos.
5.	Single Phase Induction Motor with Loading Arrangement	2 Nos.
6.	Tachometer -Digital/Analog	8 Nos.
7.	Single Phase Auto Transformer	2 Nos.
8.	Three Phase Auto Transformer	3 Nos.
9.	Single Phase Resistive Loading Bank	2 Nos.
10.	Three Phase Resistive Loading Bank	2 Nos.
11.	Capacitor Bank	1 No.

20EE4L2	LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To design, test and characterize circuit behavior with digital and analog ICs.
- To design and test various combinational and sequential circuits.
- To introduce the functions of counter, shift register.
- To interpret and realize the basic applications of Op–amp and timer.
- To explain the behavior of special ICs.

PRE-REQUISITE:

Course Code: 20EE301
Course Name: Digital Logic Circuits

LIST OF EXPERIMENTS:

1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Implementation of Binary to Gray code converter and vice-versa.
3. Implementation of Encoders, Decoders, Parity generator and parity checking.
4. Implementation of multiplexer and de multiplexer.
5. Implementation of Shift Registers: SISO, SIPO, PISO, PIPO modes.
6. Implementation of Counters: synchronous and Asynchronous types (Any two).
7. Design and testing of inverting and non-inverting amplifier, Adder,
8. Design and testing of comparator, Integrator and Differentiator.
9. Design and testing of Astable and Monostable operation using 555 timer.
10. Verification of Voltage to frequency characteristics of NE/ SE 566 IC.
11. Verification of Variability Voltage Regulator using IC LM317/LM723.
12. Simulation of inverting and Non-inverting Amplifier using PSPICE/SIMULINK

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Design and implement the combinational logic circuit for the given Boolean function.
- Design and verify the truth table of sequential logic circuits (code converters, parity generator, parity checker, encoders, decoders, multiplexer and demultiplexer).
- Design and implement the Counters and Shift registers.
- Design and testing of Op-Amp circuits (inverting amplifier, non inverting amplifier, adder, comparator, integrator and differentiator). And also analyze the input and output performance of the op-amp based circuit using simulation tools.
- Graph the astable and monostable mode response using Timer IC NE/SE 555.
- Testing of IC NE/SE 566 to show the voltage to frequency characteristics of VCO and to manipulate the variability voltage regulator using IC LM317.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: (3 per Batch)

S. No	Name of the equipments / Components	Quantity Required	Remarks
1	Dual, (0-30V) variability Power Supply	10	-
2	CRO	9	30 MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC Tester (Analog)	2	-
6	Bread board	10	-
7	Computer (PSPICE installed)	1	-
Consumables (sufficient quantity)			
1	IC 741/ IC NE555/566/565		
2	Digital IC types		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 / SG3525		
7	Transistor – 2N3391		
8	Diodes, IN4001, BY126		
9	Zener diodes		
10	Potentiometer		
11	Step-down transformer 230V/12-0-12V		
12	Capacitor		
13	Resistors 1/4 Watt Assorted		
14	Single Strand Wire		

20EE4L3	TECHNICAL SEMINAR	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To encourage the students to study advanced engineering developments in the emerging areas
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as, power point presentation, Videos and demonstrative models.

PRE-REQUISITE: NIL

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology/emerging areas, for duration of about 8 to 10 minutes. In a session of two periods per week, 15 students are expected to present the seminar. Each student is expected to present atleast twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

TOTAL: 30 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Review, prepare and present technological developments
- Face the placement interviews