

# **K.L.N. COLLEGE OF ENGINEERING**

**Pottapalayam – 630 612, Sivagangai District**

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



**Estd: 1994**

## **FIRST YEAR CURRICULUM AND SYLLABUS**

**REGULATIONS 2020**

**For Under Graduate Program**

**B.E. –ELECTRONICS AND INSTRUMENTATION**

**ENGINEERING**

**CHOICE BASED CREDIT SYSTEM**

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



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### **VISION OF THE INSTITUTION**

To become a Premier Institute of National Repute by Providing Quality Education, Successful Graduation, Potential Employability and Advanced Research & Development through Academic Excellence.

### **MISSION OF THE INSTITUTION**

To Develop and Make Students Competent Professional in the Dynamic Environment in the field of Engineering, Technology and Management by emphasizing Research, Social Concern and Ethical Values through Quality Education System.

### **VISION OF THE DEPARTMENT**

To foster the graduates with excellence in innovation and research by imparting quality education in Electronics & Instrumentation Engineering and its allied areas.

### **MISSION OF THE DEPARTMENT**

To produce competent professionals with social concern and ethical standards to cater the needs of Process automation industries and its associated fields.



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### **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

- PEO 1** To design, analyze, develop and realize complex Electronics and Instrumentation Engineering problems.
- PEO 2** To apply the emerging technologies in instrumentation and allied fields
- PEO 3** To work effectively as an individual and as a member of multidisciplinary team..
- PEO 4** To exhibit professionalism and ethical values in an eco-friendly manner.

### **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, process control and instrumentation field.
- PSO 2** Apply appropriate techniques and modern Engineering hardware and software tools to design, implement & evaluate the control, measurement, process and instrumentation system to engage in life- long learning and work effectively as an individual and in a multidisciplinary team.
- PSO 3** Understand the impact of Professional behavior and ethics, communicate effectively with engineering community and the society.



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**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. – ELECTRONICS AND INSTRUMENTATION 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 Courses (MC)** 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
<b>THEORY</b>								
1	20HS101	<a href="#">English for Technical Communication</a>	HS	3	3	0	0	3
2	20BS101	<a href="#">Fundamentals of Engineering Mathematics</a>	BS	4	3	1	0	4
3	20BS102	<a href="#">Engineering Physics</a>	BS	3	3	0	0	3
4	20BS103	<a href="#">Engineering Chemistry</a>	BS	3	3	0	0	3
5	20GE101	<a href="#">Problem Solving using Python Programming</a>	ES	3	3	0	0	3
<b>PRACTICAL</b>								
6	20BS1L1	<a href="#">Basic Science Laboratory</a>	BS	3	0	0	3	1.5
7	20GE1L1	<a href="#">Python Programming Laboratory</a>	ES	4	0	0	4	2
8	20GE1L2	<a href="#">Industrial Practices Workshop</a>	ES	3	0	0	3	1.5
<b>TOTAL</b>				<b>26</b>	<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>

SEMESTER II

B.E - Department of Electronics and Instrumentation Engineering

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

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:**

- Course Code: Nil
- Course Name: 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



<b>20BS101</b>	<b>FUNDAMENTALS OF ENGINEERING MATHEMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		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:**

Course Code: Nil

Course Name: 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. 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, 5<sup>th</sup> 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:**

Course Code: Nil

Course Name: 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, 10<sup>th</sup> 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:**

Course Code: Nil

Course Name: 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), <sup>1</sup>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, <sup>1</sup>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

<b>20GE101</b>	<b>PROBLEM SOLVING USING PYTHON PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		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, dictionaries.
- To do input/output with files in Python.

**PRE-REQUISITE:**

Course Code: Nil

Course Name: 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, Sets, 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”, 2<sup>nd</sup> 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”, 2<sup>nd</sup> Edition, BPB Publications, 2020.
2. John V Guttag, “Introduction to Computation and Programming Using Python: With Application to Understanding Data”, 2<sup>nd</sup> 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”, 3<sup>rd</sup> edition, Shroff/O’ Reilly Publishers, 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:**

Course Code: Nil

Course Name: Nil

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

- Determination of Rigidity modulus – Torsional Pendulum.
- Determination of Young's modulus – Non Uniform Bending.
- Determination of wavelength and particle size using diode laser.
  - Determination of acceptance angle in an optical fiber.
- Determination of velocity of sound and compressibility of liquid using ultrasonic interferometer.
- Determination of band gap of a semiconductor diode.
- Determination of thickness of a thin wire – Air wedge method.
- Determination of dispersive power of a prism – Spectrometer\*
- 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 EQUIPMENT 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:

Course Code: Nil

Course Name: 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<sup>th</sup> edition, 2014).

**LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<b>S.No.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
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

<b>20GE1L1</b>	<b>PYTHON PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		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:**

Course Code: Nil

Course Name: 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.

<b>20GE1L2</b>	<b>INDUSTRIAL PRACTICES WORKSHOP</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		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:**

Course Code: Nil

Course Name: 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**

<b>LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS</b>		
<b>CIVIL</b>		
<b>S. No</b>	<b>Component Name</b>	<b>No. of Components</b>
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

<b>MECHANICAL</b>		
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
<b>ELECTRICAL</b>		
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
<b>ELECTRONICS</b>		
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:**

Course Code: Nil

Course Name: 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



**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, 9<sup>th</sup> Edition, New Delhi, 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, 5<sup>th</sup> Edition, 2016.
5. Sastry, S.S. "Engineering Mathematics", Vol.I & II, PHI Learning Pvt. Ltd, 4<sup>th</sup> Edition, New Delhi, 2014.

<b>20BS203</b>	<b>PHYSICS FOR ELECTRONICS ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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:**

Course Code: Nil

Course Name: 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 – Clausius-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, 8<sup>th</sup> 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:**

Course Code: Nil

Course Name: 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, 17<sup>th</sup> Edition, 2020.
3. Kernighan, B.W and Ritchie, D.M, "The C Programming languagell", Second Edition, Pearson Education, 2015.

**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.

<b>20EE201</b>	<b>ELECTRIC CIRCUIT ANALYSIS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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:**

Course Code: Nil

Course Name: 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 Kirchoff'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. Hayt Jr, 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), Dhanpath Rai & Sons, New Delhi, 2017.
2. Jegatheesan, R., "Analysis of Electric Circuits" McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "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.

**20GE201**

**ENGINEERING GRAPHICS**

L	T	P	C
2	0	2	3

**OBJECTIVES:**

- To develop graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose national standards related to technical drawings.

**PRE-REQUISITE:**

Course Code: Nil

Course Name: Nil

**CONCEPTS AND CONVENTIONS (Not for Examination)**

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

**UNIT - I PROJECTION OF POINTS AND LINES 6+6**

Orthographic projection – Principles - Principal planes - Projection of points in all quadrants - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.

**UNIT - II PROJECTION OF PLANE SURFACES 6+6**

Projection of planes (Polygonal and Circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT - III PROJECTION OF SOLIDS 6+6**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

**UNIT - IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+6**

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

**UNIT - V ISOMETRIC PROJECTION AND FREEHAND SKETCHING 6+6**

Principles of Isometric Projection – Isometric scale – Isometric projections of simple solids - truncated Prisms and Pyramids. Visualization concepts and Free Hand sketching : Principles – Representation of Three Dimensional objects – Layout of views - Freehand sketching of multiple views from pictorial views of objects

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- Familiarize with the fundamentals and standards of Engineering graphics.
- Draw the orthographic projections of points, lines and planes.
- Draw the projections of simple solids like prisms, pyramids, cylinder and cone.
- Draw the projections of sectional views of solids and develop its lateral surfaces.
- Draw the isometric projection of simple objects, truncated prism and pyramids.
- Draw the free hand sketching of simple objects.

**TEXT BOOKS:**

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 30<sup>th</sup> Edition, 2017.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 15<sup>th</sup> Edition, 2018.

**REFERENCES:**

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53<sup>rd</sup> Edition, 2019.
2. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education, 3<sup>rd</sup> Edition, 2012.

**PUBLICATION OF BUREAU OF INDIAN STANDARDS:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001: Technical drawings - General principles of presentation.
4. IS 11669 – 1986: General principles of dimensioning on technical drawings.
5. SP 46 (2003): Engineering Drawing Practice for Colleges.
6. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

**SPECIAL POINTS APPLICABLE TO EXAMINATIONS ON ENGINEERING GRAPHICS:**

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

<b>20CS2L1</b>	<b>C PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		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:**

Course Code: Nil

Course Name: 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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:**

Course Code: Nil

Course Name: Nil

**LIST OF EXPERIMENTS:**

1. Simulation and experimental verification of electrical circuit using Ohm's law, Kirchoff's voltage and current laws.
2. Simulation and experimental verification of electrical circuit using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit using Norton's theorem.
4. Simulation and experimental verification of electrical circuit 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 Kirchoff'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)

# **K.L.N. COLLEGE OF ENGINEERING**

**Pottapalayam – 630 612, Sivagangai District**

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



**Estd: 1994**

## **SECOND YEAR CURRICULUM AND SYLLABUS**

**REGULATIONS 2020**

**For Under Graduate Program**

**B.E. ELECTRONICS AND INSTRUMENTATION**

**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 foster the graduates with excellence in innovation and research by imparting quality education in Electronics & Instrumentation Engineering and its allied areas.

### **MISSION OF THE DEPARTMENT**

To produce competent professionals with social concern and ethical standards to cater the needs of Process automation industries and its associated fields.



**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM**  
(An Autonomous Institution, Affiliated to Anna University, Chennai)



### **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

- PEO 1** To design, analyze, develop and realize complex Electronics and Instrumentation Engineering problems.
- PEO 2** To apply the emerging technologies in instrumentation and allied fields
- PEO 3** To work effectively as an individual and as a member of multidisciplinary team.
- PEO 4** To exhibit professionalism and ethical values in an eco-friendly manner.

### **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, process control and instrumentation field.
- PSO 2** Apply appropriate techniques and modern Engineering hardware and software tools to design, implement & evaluate the control, measurement, process and instrumentation system to engage in life- long learning and work effectively as an individual and in a multidisciplinary team.
- PSO 3** Understand the impact of Professional behavior and ethics, communicate effectively with engineering community and the society.



## **PROGRAM OUTCOMES (POs)**

### **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.



**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM**  
(An Autonomous Institution, Affiliated to Anna University, Chennai)



## **REGULATIONS 2020**

**For Under Graduate Program**

**B.E. ELECTRONICS AND INSTRUMENTATION 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 Courses (MC)** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc

**B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING****SEMESTER III**

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20BS304	<a href="#">Probability and Partial Differential Equations</a>	BS	4	3	1	0	4
2.	20EE301	<a href="#">Digital Logic Circuits</a>	PC*	3	3	0	0	3
3.	20EE302	<a href="#">Electron Devices and Circuits</a>	PC*	3	3	0	0	3
4.	20EE305	<a href="#">Electrical Machines</a>	ES	3	3	0	0	3
5.	20HS301	<a href="#">Universal Human Values</a> (Common to all B.E./B.Tech programmes)	HS	3	2	1	0	3
<b>THEORY CUM PRACTICAL</b>								
6.	20CS304	<a href="#">Java Programming</a>	ES	5	3	0	2	4
<b>PRACTICALS</b>								
7.	20EE3L1	<a href="#">Electronics Laboratory</a>	PC*	3	0	0	3	1.5
8.	20EE3L3	<a href="#">Electrical machines Laboratory</a>	ES	3	0	0	3	1.5
<b>TOTAL</b>				<b>27</b>	<b>17</b>	<b>2</b>	<b>8</b>	<b>23</b>

**SEMESTER IV**

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20BS402	<a href="#">Numerical Methods</a>	BS*	4	3	1	0	4
2.	20EI401	<a href="#">Electrical Measurements and Instrumentation</a>	PC	3	3	0	0	3
3.	20EI402	<a href="#">Transducer Engineering</a>	PC	3	3	0	0	3
4.	20EE403	<a href="#">Linear Integrated Circuits and Applications</a>	PC*	3	3	0	0	3
5.	20EC407	<a href="#">Fundamentals of Signals and Systems</a>	ES	4	3	1	0	4
6.	20HS401	<a href="#">Environmental Science and Engineering</a> (Common to all B.E./B.Tech programmes)	HS	2	2	0	0	2
<b>PRACTICALS</b>								
7.	20EI4L1	<a href="#">Measurements and Transducer Laboratory</a>	PC	3	0	0	3	1.5
8.	20EE4L2	<a href="#">Linear and Digital Integrated Circuits Laboratory</a>	PC*	3	0	0	3	1.5
<b>TOTAL</b>				<b>25</b>	<b>17</b>	<b>2</b>	<b>6</b>	<b>22</b>

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



- Solve differential equations using Fourier series analysis.
- Solve one and two dimensional heat flow problems and one dimensional wave equation problems.

**TEXT BOOKS:**

1. Ibe,O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, Indian Reprint , 1<sup>st</sup> edition, 2010.
2. Grewal B.S., "Higher Engineering Mathematics", 44<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2017

**REFERENCES:**

1. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8<sup>th</sup> Edition, 2011.
2. Erwin Kreyszig, "Advanced Engineering Mathematics ", John Wiley, India, 8<sup>th</sup> Edition, 2016.
3. James.G, "Advanced Modern Engineering Mathematics", Pearson Education, 3<sup>rd</sup> Edition, 2007.
4. Veerarajan.T, "Probability, Statistics and Random Processes ",Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2006.
5. 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.





**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, 6<sup>th</sup> Edition, 2018.
2. Comer “Digital Logic & State Machine Design, Oxford, 3<sup>rd</sup> Edition, 2016.
3. Thomas L Floyd “Digital Fundamentals” 11<sup>th</sup> edition, Pearson Education, 2015

**REFERENCES:**

1. James W. Bignel, Digital Electronics, Cengage learning, 5<sup>th</sup> Edition, 2007.
2. D.P.Kothari, J.S.Dhillon “Digital Circuits and Design” Pearson Education, 2016
3. Mandal, “Digital Electronics Principles & Application, McGraw Hill , 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 versus frequency characteristics of amplifiers.
- 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.

## **KLNCE UG EIE R2020**

- 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, 5<sup>th</sup> Edition, 2008.
2. Sedra and Smith, "Microelectronic circuits", 8<sup>th</sup> Ed., Oxford University Press 2020.
3. Jacob Millman, Christos C Halkias, Satyabrata Jit, 'Electronic Devices and circuits', McGraw Hill education, 4<sup>th</sup> edition, 2015.

### **REFERENCES:**

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

20EE305

**ELECTRICAL MACHINES**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To introduce the principles of operations of DC machines as motor and generator.
- To introduce the principles of operations of Transformers.
- To Understand the principles of operations of Induction machines.
- To Understand the principles of operations of Synchronous machines.
- To Understand other special machines.

**PRE-REQUISITE: NIL**

**UNIT-I D.C MACHINES 9**

D.C. Machines: – Principle of operation and construction of motor and generator –emf equation- torque equation –Various excitation schemes – Characteristics of Motor and Generator – Starting, Speed control of D.C. Motor -Simulate DC motor model in MATLAB.

**UNIT-II TRANSFORMERS 9**

Principle, Construction and Types of Transformer - EMF equation - Phasor diagrams - Regulation and efficiency of a transformer- Applications of Current and Potential Transformer - Simulate Single phase Transformer model in MATLAB.

**UNIT - III SYNCHRONOUS MACHINES 9**

Principle of Operation, type - EMF Equation and Phasor diagrams - Synchronous motor- Rotating Magnetic field, Starting Methods , Torque V- Curves, inverted – V curves.

**UNIT - IV THREE PHASE INDUCTION MOTORS 9**

Induction motor-principle of operation, Types - Torque-slip characteristics - Starting methods and Speed control of induction motors.

**UNIT – V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9**

Types of single phase induction motors –Double field revolving theory- Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor – Universal motor – Hysteresis motor - Switched reluctance motor – Brushless D.C motor.-Stepper motor.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Illustrate the construction and working principles of dc generator and motor.
- Describe the constructional details, principle of operation, testing and applications of transformers.
- Explain the constructional details, testing and applications of synchronous machines.
- Describe about the constructional details and principle of operation of three phase induction motors.
- Explain the working principle, characteristics and application of single phase induction motors.
- Explain the working principle of stepper motor, brushless motor and special machines.

**TEXT BOOKS:**

1. Theraja, B.L., "A Textbook of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi, 2018.
2. J. B. Gupta, Theory and performance of electrical machines, S.K. Kataria & sons, 2017
3. Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGraw-Hill, 2015.

**REFERENCES:**

1. Abhijit Chakrabarti and Sudipta Debnath, "Electrical Machines", McGraw- Hill Education, 2015.
2. Deshpande M. V., "Electrical Machines" PHI Learning Pvt. Ltd., New Delhi, 2011
3. B.S.Guru and H.R.Hiziroglu, "Electric Machinery and Transformer", Oxford university Press 2007
4. Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.
5. Nagrath I. J and Kothari D. P. 'Electric Machines', Fourth Edition, McGraw Hill Education, 2018.
6. C.A.Gross, "Electric Machines", CRC Press 2016.
7. NPTEL Video Lecture series on "Electrical Machines I" and "Electrical Machines II" by Dr. Krishna Vasudevan, IIT Madras.

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, 2<sup>nd</sup> 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, 4<sup>th</sup> 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.

**OBJECTIVES:**

- To understand the basic concepts of Java.
- To know the principles of packages, inheritance and interfaces.
- To define exceptions and use I/O streams.
- To develop a java application with threads and generics classes.
- To design and build simple Graphical User Interfaces

**PRE-REQUISITE: NIL****UNIT-I INTRODUCTION TO JAVA FUNDAMENTALS 9**

An Introduction to Java - The Java Programming Environment - Defining classes in Java – constructors, methods - static members -Comments, Data Types, Variables, Arrays, Operators, Control Flow, Packages.

**LAB COMPONENT 6**

1. Develop a java program using classes and methods.
2. Develop a java program using packages.

**UNIT-II INHERITANCE AND INTERFACES 9**

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface - Object cloning -inner classes, Array Lists.

**LAB COMPONENT 6**

1. Develop Java programs with the concepts of inheritance and interfaces.
2. Write a program to perform string operations using Array List.

**UNIT - III EXCEPTION HANDLING AND I/O 9**

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files,

**LAB COMPONENT 6**

1. Write a Java program to implement user defined exception handling.
2. Develop Java programs with the concepts of interfaces.

**UNIT - IV MULTITHREADING AND GENERIC PROGRAMMING 9**

Concept of thread, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Restrictions and Limitations.

**LAB COMPONENT 6**

1. Write a java program that implements a multi-threaded application.
2. Write a java program to find the maximum value from the given type of Elements using a generic function.





**20EE3L1****ELECTRONICS LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**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

**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**

<b>S.No.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
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 $\pm 15V$	10 Nos
6	CRO	10 Nos
7	Storage Oscilloscope	1 No
8	Bread boards	Sufficient
Atleast one demo kit for the listed experiment.		

**OBJECTIVES:**

To expose the students to the operation of D.C. machines and transformers and give them experimental skill

**PRE- REQUISITE: NIL****LIST OF EXPERIMENTS**

1. Open Circuit characteristics of DC shunt generator
2. Load Characteristics of DC shunt generator
3. Load characteristics of DC series generator
4. Load test on DC shunt motor
5. Speed control of dc shunt motor
6. Load test on single phase transformer
7. Open circuit and short circuit tests on single phase transformer
8. Regulation of three phase alternator by emf and mmf methods
9. V and inverted V curve of three phase synchronous motor
10. Load test on single phase induction motor
11. Speed control of three phase slip ring induction motor
12. Speed Control of DC Shunt Motor Using MATLAB simulink

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

- Apply and Deduce the principles of Electrical Machines through laboratory experimental work
- Determine the performance characteristics of DC machine by conducting direct and indirect tests
- Determine the performance characteristics of DC shunt and DC series generators by conducting load tests
- Determine the performance of a single phase transformer by conducting Open Circuit (O.C) and Short Circuit (SC) tests
- Demonstrate the starting & speed control of various AC & DC motors
- Determine the efficiency and Regulation of Transformer by various tests

## 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	DC Shunt Motor Coupled with Three phase Alternator	1 No.
3	Single Phase Transformer	4 nos
4	DC Series Motor with Loading Arrangement	1 No
5	DC compound Motor with Loading Arrangement	1 No.
6	Three Phase Induction Motor with Loading Arrangement	2 nos
7	Single Phase Induction Motor with Loading Arrangement	1 No.
8	DC Shunt Motor Coupled With DC Compound Generator	2 nos
9	DC Shunt Motor Coupled With DC Shunt Motor	1 No.
10	Tachometer -Digital/Analog	8 nos
11	Single Phase Auto Transformer	2 nos
12	Three Phase Auto Transformer	1 No.
13	Single Phase Resistive Loading Bank	2 nos
14	Three Phase Resistive Loading Bank.	2 nos
15	Matlab software	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 and Partial 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 and Backward 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, 10<sup>th</sup> Edition, 2015.
2. Sastry. S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt.Ltd, 5<sup>th</sup> Edition, 2018.

**REFERENCES:**

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

**20EI401 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION**

L	T	P	C
3	0	0	3

**OBJECTIVES:**

- To understand the current & voltage measurements.
- To discuss the measurement techniques for power and energy, power and energy meters are included.
- To understand the resistance and impedance measurements.
- To understand electronic voltmeters and their applications.
- To demonstrate different types of signal generator and give exposure to telemetry techniques.

**PRE-REQUISITE:**

Course code : 20BS203  
 Course Name : Physics for electronics engineering

**UNIT-I MEASUREMENT OF VOLTAGE AND CURRENT 9**

Galvanometers: – Ballistic, D’Arsonval galvanometer – Theory, calibration, application – Principle, construction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type & thermal type meter, rectifier type – Extension of range and calibration of voltmeter and ammeter.

**UNIT-II MEASUREMENT OF POWER AND ENERGY 9**

Electrodynamometer type wattmeter: – Theory & its errors – Methods of correction – LPF wattmeter– Phantom loading – Induction type kWh meter – Induction type energy meter – Calibration of wattmeter and Energy meter.

**UNIT - III RESISTANCE AND IMPEDANCE MEASUREMENT 9**

Measurement of low, medium & high resistance: – Wheatstone bridge– Kelvin double bridge – High resistance measurement -Megger – Earth resistance measurement- A.C bridges:– Measurement of inductance, capacitance – Maxwell Bridge – Schering bridge – Anderson bridge –Hay’s bridge- Errors in A.C. bridge methods and their compensation.

**UNIT - IV ELECTRONIC INSTRUMENTS 9**

Electronic Voltmeter – Types – True rms reading voltmeter – Electronic multimeter and ohmmeter – Microprocessor based DMM with auto ranging and self diagnostic features. General purpose cathode ray oscilloscope – Dual trace, dual beam and sampling oscilloscopes– digital storage oscilloscope - frequency selective and heterodyne wave analyzer – Harmonic distortion analyzer – Spectrum analyzer.

**UNIT - V TELEMETRY AND SIGNAL GENERATOR 9**

General telemetry system – voltage, current and position telemetry systems – Radiofrequency telemetry – Frequency modulation, pulse-amplitude modulation and pulse-code modulation telemetry –Signal and function generators –Sinewave generator-Q meter – Electronic Counters.

**TOTAL: 45 PERIODS**



**OUTCOMES:**

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

- Illustrate basic meters such as voltmeter and ammeter
- Demonstrate the operating principle and types of power and energy meter
- Explain the fundamental method of resistance measurement using various bridge circuits and meters.
- Explain the fundamental method of impedance measurement using various bridge circuits.
- Explain the working principle and applications of various electronic instruments.
- Explain the different telemetry systems, modulation techniques for various industrial application purposes.

**TEXT BOOKS:**

1. A.K. Sawhney, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2015.
2. A.D. Helfrick and W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall India Private Ltd., New Delhi, 2010.

**REFERENCES:**

1. E.W. Golding & F.C. Widdis, 'Electrical Measurements & Measuring Instruments', A.H. Wheeler & Co, 2001
2. J.J. Carr, Elements of Electronic Instrumentation and Measurement, Pearson Education India, New Delhi, 2011.
3. M.M.S. Anand, Electronics Instruments and Instrumentation Technology, Prentice Hall India, New Delhi, 2009.
4. H.S. Kalsi, Electronic Instrumentation and Measurement, Tata McGraw-Hill 4th edition, New Delhi, 2019
5. J.B. Gupta, 'A Course in Electronic and Electrical Measurements and Instrumentation', S.K. Kataria & Sons, Delhi, 2003.

**20EI402**

**TRANSDUCER ENGINEERING**

L	T	P	C
3	0	0	3

**OBJECTIVES:**

- Get to know the methods of measurement, classification of transducers and to analyze error.
- To understand the behavior of transducers under static and dynamic conditions.
- Get exposed to different types of resistive transducers and their application areas.
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers and get introduced to MEMS and Smart transducers.

**PRE-REQUISITE:**

Course Code : 20BS203

Course Name : Physics for Electronics Engineering

**UNIT-I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 9**

Units and standards – Static calibration – Classification of errors, Limiting error and probable error –Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

**UNIT-II CHARACTERISTICS OF TRANSDUCERS 9**

Static characteristics: - Accuracy, precision, resolution, sensitivity, linearity, span and range. Dynamic characteristics: Mathematical model of transducer, Zero, I and II order transducers, Response to impulse, step, ramp and sinusoidal inputs.

**UNIT - III VARIABLE RESISTANCE TRANSDUCERS 9**

Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge-types, Resistance Temperature Detector, Thermistor -signal conditioning, hot-wire anemometer, piezo-resistive sensor and humidity sensor.

**UNIT – IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9**

Inductive transducers: – Principle of operation, construction details, characteristics of LVDT, Induction potentiometer – Variable reluctance transducers and applications. Principle of operation, construction details, characteristics of capacitive transducers – types & Signal Conditioning – Applications:- Capacitor microphone, Capacitive pressure sensor, Proximity sensor.

**UNIT - V OTHER TRANSDUCERS 9**

Piezoelectric transducer – Hall Effect transducer – Magneto elastic sensor – Digital transducers –Fiber optic sensors – Thick & Thin Film sensors (Bio sensor & Chemical Sensor) – Environmental Monitoring sensors (Water Quality & Air pollution) – Introduction to MEMS – Introduction to Smart transducers and its interface standard (IEEE 1451)-Smart transmitter.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Describe the concepts of Measurements and classification of Errors & calculate the deviations from the given test data.
- Identify the suitable sensor/transducer for a given application.
- Discuss the static and dynamic characteristics of transducers.
- Describe the principle of Resistive Transducers and develop signal conditioning circuit.
- Explain the principle of Inductive & Capacitive Transducers and its applications.
- Describe the working of Miscellaneous and smart transducer.

**TEXT BOOKS:**

1. Murthy, D.V.S., Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
2. A.K. Sawhney, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2010.

**REFERENCES:**

1. Doebelin E.O. and Manik D.N., "Measurement Systems", 7th Edition, McGraw-Hill Education Pvt. Ltd., 2019.
2. John P. Bentley, Principles of Measurement Systems, 4<sup>th</sup> Edition, Pearson Education, 2005.
3. W.Bolton, Engineering Science, Elsevier Newnes, 7<sup>th</sup> Edition, 2020.
4. Ian Sinclair, Sensors and Transducers, 3<sup>rd</sup> Edition, Elsevier, 2012.
5. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
6. A.K. Sawhney and Puneet Sawhney, A course in Mechanical Measurements and Instrumentation & Control, Dhanpat Rai & Co 2013.

<b>20EE403</b>	<b>LINEAR INTEGRATED CIRCUITS AND APPLICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 OPAMP 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 OPAMP 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 - Analog multiplier and Divider.

**UNIT – V APPLICATION ICs 9**

IC voltage regulators – LM78XX, LM79XX series voltage regulator - LM317, 723 Variability voltage regulators –  $\mu$ A78S40 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  $\mu$ A78S40 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", 5<sup>th</sup> Edition, New Age, 2018.
3. Ramakant A. Gayakward, "Op–Amps and Linear Integrated Circuits", 4<sup>th</sup> 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, 2<sup>nd</sup> edition, 2017.
6. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill,2016.

<b>20EC407</b>	<b>FUNDAMENTALS OF SIGNALS AND SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To understand the basic properties of signal & systems
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signals and system in the Fourier and Laplace domain
- To analyze discrete time signals and system in the Fourier and Z transform domain

**PRE-REQUISITE:**

Course code: 20BS201

Course Name: Laplace Transform and Advanced Calculus

**UNIT-I CLASSIFICATION OF SIGNALS AND SYSTEMS 12**  
 Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids –Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, even & odd signals, Deterministic & Random signals, Energy & Power signals – Classification of systems – CT systems and DT systems – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Static & Dynamic, Stable & Unstable.

**UNIT-II ANALYSIS OF CONTINUOUS TIME SIGNALS 12**  
 Fourier series for periodic signals – Fourier Transform – Fourier transform pair – Properties – Transforms of simple functions – Convolution theorem – Parseval’s identity – Laplace Transform – properties.

**UNIT - III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 12**  
 Impulse response – convolution integrals – Solution of differential Equation using Laplace transforms – Fourier and Laplace transforms in Analysis of CT systems – Systems connected in series and parallel.

**UNIT - IV ANALYSIS OF DISCRETE TIME SIGNALS 12**  
 Baseband signal Sampling – Sampling Theorem- Fourier Transform of discrete time signals (DTFT) – Properties of DTFT – Z Transform & Properties.

**UNIT - V LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS 12**  
 Convolution sum – Impulse response – Solution of difference equations using Z Transform – Analysis of Recursive & Non-Recursive systems – Systems connected in series and parallel.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- Represent basic continuous time and discrete time signals.
- Explain signal properties such as periodicity, even or odd, energy or power and system properties such as linearity and time-invariance, causality and stability.
- Analyze continuous time signals in the Fourier and Laplace domain.

- Analyze and characterize LTI CT system using Laplace Transform.
- Analyze discrete time signals in the Fourier and Z transform domain
- Analyze and characterize LTI DT system using Z Transform

**TEXT BOOKS:**

1. Simon Haykin, "Signals & Systems", Wiley, 2<sup>nd</sup> edition, 2007
2. B.P.Lathi and R.A.Green, "Principles of Linear Systems and Signals", Oxford University Press, 3<sup>rd</sup> Edition, 2018.

**REFERENCES:**

1. Allan V. Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2015.
2. Hwei P. Hsu, "Schaum Outlines - Signals and Systems Matlab Examples", McGraw Hill, 4<sup>th</sup> Edition 2019.
3. R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
4. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.
5. S.Nagoorkani, "Signals and Systems - Simplified", McGraw Hill, 1<sup>st</sup> Edition, 2018.

**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 utilization.
- 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", 2<sup>nd</sup> edition, Pearson Education, 2004.

<b>20EI4L1</b>	<b>MEASUREMENTS AND TRANSDUCER LABORATORY</b>	<b>L 0</b>	<b>T 0</b>	<b>P 3</b>	<b>C 1.5</b>
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**OBJECTIVES:**

- To analyse dynamic characteristics of different types of transducer.
- To analyze step response of RTD and Thermocouple
- To measure unknown resistance using bridge circuits.
- To impart calibration methods for various the electrical instruments

**PRE-REQUISITE: NIL**

**LIST OF EXPERIMENTS**

1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Characteristics of Strain gauge and Load cell.
3. Characteristics of LVDT and Hall Effect transducer.
4. Characteristics of LDR, thermistor and thermocouple.
5. Step response characteristic of RTD and thermocouple.
6. Temperature measurements using RTD with three and four leads.
7. Wheatstone and Kelvin's bridge for measurement of resistance.
8. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
9. Measurement of capacitance using Capacitive transducer.
10. Calibration of Single-phase Energy meter and wattmeter.
11. Calibration of Ammeter and Voltmeter using Shunt type Ohmmeter.
12. Design and testing of signal conditioning circuit for RTD

**OUTCOMES:**

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

- Explain the concepts of measurement error and nonlinearity.
- Explain the static and dynamic characteristics of measuring instruments.
- Gain knowledge about the principle of operation and characteristics of different types of resistance, capacitance and inductance transducers.
- Design signal conditioning circuit for a given transducer.
- Determine unknown values of passive element using Bridges.
- Calibrate Energy meter and Watt meters using working standards.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<b>S.No.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
1	Experimental setup for Measurement of Linear displacement using Potentiometer	1
2	Strain gauge and Load cell characterization and application	Each 1
3	LVDT characterization and application	1
4	Hall Effect characterization and application	1
5	Experimental setup for Measurement of power and energy	1
6	Muffle furnace Thermistor characterization and application	1
7	Various types of Thermocouple and RTD characterization and application	Each 1
8	Experimental setup for measurement of unknown resistance, Capacitance and inductances.	Each 1
9	Sufficient number of power supply, Galvanometer, Bread board, Multimeter, resistors, Decade Capacitance box, Decade resistance box, Decade Inductance box, CRO.	-

20EE4L2	<b>LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY</b>	<b>L</b> <b>0</b>	<b>T</b> <b>0</b>	<b>P</b> <b>3</b>	<b>C</b> <b>1.5</b>
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**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 & 20EE403

Course Name: Digital Logic Circuits & Linear Integrated Circuits and Applications

**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	-
<b>Consumables (sufficient quantity)</b>			
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		