

KLNCE UG EEE R2020 (AY 2022-2023)

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

**Pottapalayam-630612, Sivagangai District**

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



**Estd: 1994**

**FIRST & SECOND YEAR  
CURRICULA AND SYLLABI  
REGULATIONS 2020  
For Under Graduate Program  
B.E. – ELECTRICAL AND ELECTRONICS  
ENGINEERING**

**CHOICE BASED CREDIT SYSTEM**

**(For the students admitted in the academic year 2022-2023)**



### **VISION OF THE INSTITUTION**

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

### **MISSION OF THE INSTITUTION**

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

### **VISION OF THE DEPARTMENT**

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

### **MISSION OF THE DEPARTMENT**

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



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

- PEO 1** To excel in industrial or graduate work in Electrical and Electronics Engineering and allied fields.
- PEO 2** To practice their Professions conforming to Ethical Values and Environmentally friendly policies.
- PEO 3** To work in international and multi-disciplinary Environments.
- PEO 4** To successfully adapt to evolving Technologies and stay current with their Professions.

### **PROGRAM SPECIFIC OUTCOMES (PSOs)**

- PSO 1** Apply the fundamentals of Mathematics, Science and Engineering knowledge to identify, formulate, design and investigate complex engineering problems of Electric Circuits, Analog and Digital Electronic Circuits, Electrical Machines and Power Systems.
- PSO 2** Apply appropriate techniques and modern Engineering hardware and software tools in Power Systems to engage in life- long learning and to successfully adapt in multidisciplinary environments.



**PO1: Engineering knowledge**

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

**PO2: Problem analysis**

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

**PO3: Design/development of solutions**

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

**PO4: Conduct investigations of complex problems**

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

**PO5: Modern tool usage**

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

**PO6: The engineer and society**

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

**PO7: Environment and sustainability**

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

**PO8: Ethics**

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

**PO9: Individual and team work**

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

**PO10: Communication**

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

**PO11: Project management and finance**

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

**PO12: Life-long learning**

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



**REGULATIONS 2020**  
**For Under Graduate Program**  
**B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING**  
**CHOICE BASED CREDIT SYSTEM**

**CATEGORY OF COURSES**

- i. **Humanities and Social Sciences (HS) Courses** include Technical English, Environmental Science and Engineering, Engineering Ethics and human values, Communication Skills and Management courses.
- ii. **Basic Sciences (BS) Courses** include Mathematics, Physics, and Chemistry.
- iii. **Engineering Sciences (ES) Courses** include Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering / Instrumentation etc.
- iv. **Professional Core (PC) Courses** include the core courses relevant to the chosen programme of study.
- v. **Professional Elective (PE) Courses** include the elective courses relevant to the chosen programme of study.
- vi. **Open Elective (OE) Courses** include courses from other departments which a student can choose from the list specified in the curriculum of the students B.E. / B.Tech. Programmes.
- vii. **Employability Enhancement Courses (EEC)** include Project Work and/or Internship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.
- viii. **Mandatory (MC) Courses** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc



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**REGULATIONS 2020**



**CHOICE BASED CREDIT SYSTEM**  
**B.E. – ELECTRICAL AND ELECTRONICS ENGINEERING**

**CURRICULAM AND SYLLABUS**  
**I TO IV SEMESTERS**

**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**

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 and B.E. ECE programmes)	BS	3	3	0	0	3
4	20CS201	<a href="#">Programming in C</a> (Common to B.E. EEE, B.E. CSE, B.Tech IT & B.Tech AIDS programmes)	ES	3	3	0	0	3
5	20EE201	<a href="#">Electric Circuit Analysis</a>	PC	4	3	1	0	4
6	20GE206	<a href="#">Engineering Graphics</a> (Common to all B.E./B.Tech programmes)	ES	3	3	0	0	3
7	20HST01	<a href="#">தமிழர் மரபு /Heritage of Tamil</a> (Common to all B.E./B.Tech programmes)	HS	1	1	0	0	1#
<b>PRACTICAL</b>								
8	20CS2L1	<a href="#">C Programming Laboratory</a> (Common to B.E. EEE, B.E. CSE, B.Tech .IT & B.Tech AIDS programmes)	ES	4	0	0	4	2
9	20EE2L2	<a href="#">Electric Circuits Laboratory</a>	PC	4	0	0	4	2
<b>TOTAL</b>				<b>29</b>	<b>19</b>	<b>2</b>	<b>8</b>	<b>24</b>

# Credit assigned will not be taken into account for GPA calculations

**KLNCE UG EEE R2020 (AY 2022-2023)**  
**SEMESTER III**

S. No	Course Code	Course title	category	Contact periods	L	T	P	C
<b>THEORY</b>								
1.	20BS301	<a href="#">Transforms and Partial Differential Equations</a> (Common to B.E Mech & B.E EEE programmes)	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.	20EE303	<a href="#">Electromagnetic Theory</a>	PC	4	3	1	0	4
5.	20EE304	<a href="#">Electrical Machines – I</a>	PC	4	3	1	0	4
6.	20HS301	<a href="#">Universal Human Values</a> (Common to all B.E./B.Tech programmes)	HS	3	2	1	0	3
7.	20HST02	<a href="#">தமிழ்நாட்டுத் தொழில்நுட்பமும் /Tamil and Technology</a> (Common to all B.E./B.Tech programmes)	HS	1	1	0	0	1#
<b>PRACTICAL</b>								
8.	20EE3L1	<a href="#">Electronics Laboratory</a>	PC	3	0	0	3	1.5
9.	20EE3L2	<a href="#">Electrical Machines Laboratory – I</a>	PC	3	0	0	3	1.5
<b>TOTAL</b>				<b>28</b>	<b>18</b>	<b>4</b>	<b>6</b>	<b>24</b>

# Credit assigned will not be taken into account for GPA calculations

**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.	20EE401	<a href="#">Electrical Machines – II</a>	PC	4	3	1	0	4
3.	20EE402	<a href="#">Transmission and Distribution</a>	PC	3	3	0	0	3
4.	20EE403	<a href="#">Linear Integrated Circuits and Applications</a>	PC	3	3	0	0	3
5.	20EE404	<a href="#">Measurements and Instrumentation</a>	PC	3	3	0	0	3
6.	20HS401	<a href="#">Environmental Science and Engineering</a> (Common to all B.E./B.Tech programmes)	HS	2	2	0	0	2
<b>PRACTICAL</b>								
7.	20EE4L1	<a href="#">Electrical Machines Laboratory – II</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
9.	20EE4L3	<a href="#">Technical Seminar</a>	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>27</b>	<b>17</b>	<b>2</b>	<b>8</b>	<b>23</b>

<b>20HS101</b>	<b>ENGLISH FOR TECHNICAL COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	0	0	3

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

**UNIT - I      FOCUSING LANGUAGE DEVELOPMENT      9**

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

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

**UNIT - II      GRAMMAR AND TECHNICAL READING      9**

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

**UNIT - III      GRAMMAR AND LANGUAGE DEVELOPMENT      9**

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

**UNIT - IV      READING AND LANGUAGE DEVELOPMENT      9**

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

**UNIT - V EXTENDED WRITING**

**9**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

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

**KLNCE UG EEE R2020 (AY 2022-2023)**

<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: 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.



**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.

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL****UNIT - I WATER AND ITS TREATMENT 9**

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

**UNIT - II ELECTROCHEMISTRY AND CORROSION 9**

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

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

**UNIT - III PHASE RULE AND ALLOYS 9**

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

**UNIT - IV FUELS AND BATTERIES 9**

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

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

**UNIT - V ANALYTICAL TECHNIQUES**

**9**

Spectroscopic techniques – UV-visible (Principle and Instrumentation – Block Diagram only and applications), IR (Principle and Instrumentation – Block Diagram only and applications), <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

**KLNCE UG EEE R2020 (AY 2022-2023)**

<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 and dictionaries.
- To do input/output with files in Python.

**PRE-REQUISITE: NIL****UNIT - I COMPUTER FUNDAMENTALS AND PROBLEM SOLVING 9**

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

**UNIT - II DATA, EXPRESSIONS, CONTROL FLOW STATEMENTS 9**

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

**UNIT - III FUNCTIONS, STRINGS 9**

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

**UNIT - IV LISTS, TUPLES, SETS DICTIONARIES 9**

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

**UNIT - V FILES, MODULES, PACKAGES 9**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

1. Yashavant Kanetkar, Aditya Kanetkar, "Let Us Python", 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'ReillyPublishers, 2018.
6. Dr. A. Kannan, Dr. L. Sai Ramesh, "Problem Solving and Python Programming, Updated Edition", United Global Publishers Pvt. Ltd., April 2018.

**PHYSICS LABORATORY**

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

**LIST OF EXPERIMENTS**

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

- 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 EQUIPMENTS FOR A BATCH OF 30 STUDENTS**

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

**KLNCE UG EEE R2020 (AY 2022-2023)**  
**CHEMISTRY LABORATORY**

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

**Any Five experiments to be given**

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

**TOTAL(Physics & Chemistry): 45 PERIODS**

**OUTCOMES:**

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

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

**REFERENCE:**

1. Vogel's "Text book of quantitative chemical analysis" (8<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

**KLNCE UG EEE R2020 (AY 2022-2023)**

**20GE1L1**

**PYTHON PROGRAMMING LABORATORY**

L	T	P	C
0	0	4	2

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

**LIST OF PROGRAMS**

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

**PLATFORM NEEDED:** Python 3 interpreter for Windows/Linux

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

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

<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: 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.

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**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,	5 sets

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	wire brush, etc.	
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.

<b>20HS201</b>	<b>ADVANCED TECHNICAL COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	0	0	3

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

**UNIT - I TECHNICAL WRITING 9**

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

**UNIT - II BUSINESS ENGLISH AND LANGUAGE DEVELOPMENT 9**

**Listening:** Listening to Audio-Visual documentary, TV Programs of Celebrities Forum. **Speaking:** Self-Expression, Introducing the fellow students, Talking about celebrities, leaders  
**Reading:** Company Correspondence, Business Correspondence, Technical Text for Vocabulary  
**Writing:** Bibliography, Sentence Completion, Cloze exercises, Verbal Analogy, Letter – Business enquiry orders, payments, Minutes Preparation.

**UNIT - III VISUAL BASED LANGUAGE DEVELOPMENT 9**

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

**UNIT - IV EMPLOYABILITY CORRESPONDENCE 9**

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

**UNIT - V TECHNICAL REPORT WRITING**

**9**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

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

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<b>20BS201</b>	<b>LAPLACE TRANSFORM AND ADVANCED CALCULUS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	1	0	4

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL****UNIT - I LAPLACE TRANSFORM 12**

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

**UNIT - II MULTIPLE INTEGRALS 12**

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

**UNIT - III VECTOR CALCULUS 12**

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

**UNIT - IV ANALYTIC FUNCTIONS 12**

Analytic functions – Necessary and Sufficient Conditions for Analyticity in Cartesian and Polar Coordinates – Properties – Harmonic Conjugates – Construction of Analytic Function – Conformal Mapping – Mapping by Functions  $w = z+c$ ,  $cz$ ,  $1/z$ ,  $z^2$  -Bilinear transformation.

**UNIT - V COMPLEX INTEGRATION 12**

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- Understand the properties of Laplace transforms and to find the Laplace transform of some standard functions.
- Apply Laplace transform and inverse transform to solve the initial value problems.
- Solve the multiple integrals and apply the concept to find areas, volumes.
- Evaluation of line, surface and volume integrals using Green's, Gauss and Stokes theorems.
- Determine Analytic functions, Bilinear Transformations and apply the concept of conformal mapping to find the images of given curves.
- Evaluation of Contour Integrals using Cauchy's Integral and Residue theorems.

**TEXT BOOKS:**

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

**REFERENCES:**

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



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### 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**

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

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

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

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

**UNIT - II      ARRAYS AND STRINGS      9**

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

**UNIT - III      FUNCTIONS AND POINTERS      9**

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

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

**UNIT - IV      STRUCTURES AND UNIONS      9**

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

**UNIT - V      FILE PROCESSING      9**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

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

<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: NIL**

**UNIT - I BASIC CIRCUITS ANALYSIS 12**

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

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

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

**UNIT - III RESONANCE AND COUPLED CIRCUITS 12**

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

**UNIT - IV TRANSIENT RESPONSE ANALYSIS 12**

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

**UNIT - V THREE PHASE CIRCUITS 12**

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.
2. William H. 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.

**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: 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 9**

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 9**

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

**UNIT - III PROJECTION OF SOLIDS 9**

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 9**

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 9**

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: 45 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.

**KLNCE UG EEE R2020 (AY 2022-2023)**

<b>20HST01</b>	<b>HERITAGE OF TAMILS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		1	0	0	1
					<b>3</b>

**UNIT - I LANGUAGE AND LITERATURE**

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

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

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

**UNIT - III FOLK AND MARTIAL ARTS** **3**

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

**UNIT - IV THINAI CONCEPT OF TAMILS** **3**

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

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

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

**TOTAL: 15 PERIODS****TEXT-CUM-REFERENCEBOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை ( வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். ( விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் ( தொல்லியல் துறை வெளியீடு)
4. பொருளந - ஆற்றங்கரை நாகரீகம். ( தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

## KLNCE UG EEE R2020 (AY 2022-2023)

9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book And Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

20HST01	தமிழர் மரபு	L	T	P	C
		1	0	0	1

**அலகு -I மொழி மற்றும் இலக்கியம்:** 3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்வி லக்கியங்கள் சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்தவ சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

**அலகு -II மரபு - பறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை:** 3

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

**அலகு -III நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள்:** 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கனியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலி யாட்டம், தமிழர்களின் விளையாட்டுகள்

**அலகு -IV தமிழர்களின் திணைக் கோட்பாடுகள்:** 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்க கால நகரங்களும் துறைமுகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**அலகு -V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்** 3

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### தமிழர்களின் பங்களிப்பு:

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிற்ப்பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப் படிக்கல்கள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு.

**TOTAL: 15 PERIODS**

### TEXT-CUM-REFERENCEBOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை ( வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். ( விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் ( தொல்லியல் துறை வெளியீடு)
4. பொருளந - ஆற்றங்கரை நாகரீகம். ( தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book And Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**OBJECTIVES:**

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

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

1. Programs using I/O statements, expressions and decision-making constructs
2. Program for finding given year is leap year or not and finding given number is Armstrong number or not.
3. Design a calculator to perform the operations namely, addition, subtraction, multiplication, division and square of a number.
4. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
  - 5 if it is a perfect cube.
  - 4 if it is a multiple of 4 and divisible by 6.
  - 3 if it is a prime number.
 Sort the numbers based on the weight in the increasing order as shown below  
 <10,its weight>,<36,its weight><89,its weight>
5. Matrix addition and subtraction
6. Matrix multiplication and transpose of a matrix
7. Program using string with and without using string functions: string copy and Reverse the String.
8. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
9. From a given paragraph perform the following using built-in functions:
  - a. Find the total number of words.
  - b. Capitalize the first word of each sentence.
  - c. Replace a given word with another word.
10. Program using recursion – factorial and Fibonacci series
11. Sort the list of numbers using pass by reference.
12. Generate salary slip of employees using structures and pointers.
13. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
14. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
15. **Mini project (Any one project : Maximum 4 per Team)**
  - Railway reservation system
  - Library Management System
  - University Result Publication System
  - Hospital Management System
  - Student Automation System
  - Payroll System
  - Banking System
  - Inventory System

**PLATFORM NEEDED:** Turbo C++ Compiler**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

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

**OBJECTIVES:**

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

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

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

**TOTAL: 60 PERIODS****OUTCOMES:****AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

- Apply 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)

<b>20BS301</b>	<b>TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS</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 make the student familiar with the topics such as Fourier Transforms, Z-Transforms and Fourier series.
- To learn the formation of partial differential equations and the solution of first order and higher order partial differential equations.
- To apply Fourier series to solve one dimensional wave, one and two dimensional heat equations which occur frequently in various branches of engineering disciplines.

**PRE-REQUISITE: NIL**

**UNIT - I PARTIAL DIFFERENTIAL EQUATIONS 12**

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

**UNIT - II FOURIER SERIES 12**

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

**UNIT - III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12**

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

**UNIT - IV FOURIER TRANSFORMS 12**

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

**UNIT - V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 12**

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

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



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

**KLNCE UG EEE R2020 (AY 2022-2023)****20EE302****ELECTRON DEVICES AND CIRCUITS**

L	T	P	C
3	0	0	3

**OBJECTIVES:**

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

**PRE-REQUISITE:**

Course Code: 20BS203 &amp; 20EE201

Course Name: Physics for Electronics Engineering &amp; Electric Circuit Analysis

**UNIT - I PN JUNCTION DEVICES****9**

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

**UNIT - II BJT AND SMALL SIGNAL AMPLIFIERS****9**

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

**UNIT - III FIELD EFFECT TRANSISTORS AND THYRISTORS****9**

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

**UNIT - IV DIFFERENTIAL AMPLIFIERS AND LARGE SIGNAL AMPLIFIERS****9**

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

**UNIT - V FEEDBACK AMPLIFIERS AND OSCILLATORS****9**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Explain the operation and characteristics of PN junction diode, Zener diode, LED and Laser diode.
- Derive the expression for voltage gain, current gain, input resistance and output resistance of a BJT CE amplifier with voltage divider biasing using h-parameter model.
- Derive the expression for voltage gain, input resistance and output resistance of FET amplifier under CS and Source follower connection.
- Explain the operation of cascade amplifier, differential amplifier, single tuned amplifier and power amplifier.
- Derive the expression for gain with feedback, input resistance and output resistance of different negative feedback connections.
- Determine the oscillating frequency of RC and LC tuned Oscillators for a specific application.

**TEXT BOOKS:**

1. David A. Bell, "Electronic Devices and Circuits", Oxford University press higher education, 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.

**KLNCE UG EEE R2020 (AY 2022-2023)****20EE303****ELECTROMAGNETIC THEORY**

L	T	P	C
3	1	0	4

**OBJECTIVES:**

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

**PRE-REQUISITE:**

Course Code: 20BS101, 20BS201 &amp; 20EE201

Course Name: Fundamentals of Engineering Mathematics, Laplace Transform and Advanced Calculus &amp; Electric Circuit Analysis

**UNIT - I VECTOR CALCULUS****12**

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

**UNIT - II STATIC ELECTRIC FIELDS****12**

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

**UNIT - III STATIC MAGNETIC FIELDS****12**

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

**UNIT - IV TIME VARYING FIELDS****12**

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

**UNIT - V ELECTROMAGNETIC WAVES****12**

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

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

**OBJECTIVES:**

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

**PRE-REQUISITE:**

Course Code: 20EE201

Course Name: Electric Circuit Analysis

**UNIT - I DC GENERATOR 12**

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

**UNIT - II DC MOTOR 12**

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

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

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

**UNIT - IV TRANSFORMER 12**

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

**UNIT - V TESTING OF TRANSFORMER 12**

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- Calculate the required field turns and brush adjustment to compensate the armature reaction and explain the construction and working of D.C generator.
- Analyze the characteristics of D.C motor to identify its applications based on requirement
- Calculate the required resistance to minimize the starting current of D.C motor and to predetermine the efficiency of d.c machine in different methods
- Explain the construction and working of transformer for different loading condition with required phasor diagram.
- Analyze the conversion of two winding transformer into auto transformer for different connection and to calculate increase in efficiency and cost saving
- Calculate the efficiency of distribution transformer by direct loading and indirect loading

**TEXT BOOKS:**

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

**REFERENCES:**

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

**KLNCE UG EEE R2020 (AY 2022-2023)**

<b>20HS301</b>	<b>UNIVERSAL HUMAN VALUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**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**

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### 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.

**KLNCE UG EEE R2020 (AY 2022-2023)**

20HST02	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1
<b>UNIT - I WEAVING AND CERAMIC TECHNOLOGY</b>					<b>3</b>

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

**UNIT - II DESIGN AND CONSTRUCTION TECHNOLOGY** **3**

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period -Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.

**UNIT - III MANUFACTURING TECHNOLOGY** **3**

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads - Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.

**UNIT - IV AGRICULTURE AND IRRIGATION TECHNOLOGY** **3**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conchediving - Ancient Knowledge of Ocean - Knowledge Specific Society.

**UNIT - V SCIENTIFIC TAMIL & TAMIL COMPUTING** **3**

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

**TOTAL: 15 PERIODS**

**TEXT-CUM-REFERENCEBOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை ( வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். ( விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் ( தொல்லியல் துறை வெளியீடு)
4. பொருளந - ஆற்றங்கரை நாகரீகம். ( தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

## KLNCE UG EEE R2020 (AY 2022-2023)

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book And Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

20HST02	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1
<b>அலகு -I நெசவு மற்றும் பாணை தொழில் நுட்பம்:</b>					<b>3</b>
சங்க காலத்தில் நெசவுத் தொழில் - பனைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பண்டங்களில் கீறல் குறியீடுகள்.					
<b>அலகு -II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் :</b>					<b>3</b>
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடு கல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரம் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிப்பாட்டு தலங்கள் - நாயக்கர் கால கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோ செனிக் கட்டிடக்கலை.					
<b>அலகு -III உற்பத்தி தொழில் நுட்பம் :</b>					<b>3</b>
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்					
<b>அலகு -IV வேளாண்மை மற்றும் நீர் பாசன தொழில்நுட்பம்:</b>					<b>3</b>
அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்					

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வளம் - முத்து மற்றும் முத்துக் குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவு சார் சமூகம்.

**அலகு -V அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்:**

3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்

**TOTAL: 15 PERIODS**

### TEXT-CUM-REFERENCEBOOKS

- 1.தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை ( வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
- 2.கணினித்தமிழ் - முனைவர் இல. சுந்தரம். ( விகடன் பிரசுரம்).
- 3.கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் ( தொல்லியல் துறை வெளியீடு)
- 4.பொருளந - ஆற்றங்கரை நாகரீகம். ( தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book And Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

**LIST OF EXPERIMENTS:**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

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

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

**PRE-REQUISITE: NIL**

**LIST OF EXPERIMENTS:**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

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

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

**KLNCE UG EEE R2020 (AY 2022-2023)****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.

**20EE401**

**ELECTRICAL MACHINES - II**

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

**PRE-REQUISITE:**

Course Code: 20EE201, 20EE303 & 20EE304

Course Name: Electric Circuit Analysis, Electromagnetic Theory & Electrical Machines – I.

**UNIT - I SYNCHRONOUS GENERATOR 12**

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

**UNIT - II SYNCHRONOUS MOTOR 12**

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

**UNIT - III THREE PHASE INDUCTION MOTOR 12**

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

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

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

**UNIT - V SINGLE PHASE INDUCTION MOTOR AND SPECIAL MACHINES 12**

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

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

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

**OBJECTIVES:**

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

**PRE-REQUISITE:**

Course Code: 20EE201 & 20EE303

Course Name: Electric Circuit Analysis & Electromagnetic Theory

**UNIT - I TRANSMISSION LINE PARAMETERS 9**

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

**UNIT - II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9**

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

**UNIT - III MECHANICAL DESIGN OF LINES 9**

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

**UNIT - IV UNDER GROUND CABLES 9**

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

**UNIT - V DISTRIBUTION SYSTEMS 9**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

**TEXT BOOKS:**

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

**REFERENCES:**

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

<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 OP-AMP 9**

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

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

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

**UNIT - IV SPECIAL ICs 9**

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

**UNIT - V APPLICATION ICs 9**

IC voltage regulators – LM78XX, LM79XX series voltage regulator - LM317, 723 Variability voltage regulators –  $\mu$ 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, 6<sup>th</sup> 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>20EE404</b>	<b>MEASUREMENTS AND INSTRUMENTATION</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 basic functional elements of instrumentation
- To introduce the fundamentals of electrical and electronic instruments
- To educate on the comparison between various measurement techniques
- To introduce various storage and display devices
- To introduce various transducers and the data acquisition systems.

**PRE-REQUISITE:**

Course Code: 20EE201  
 Course Name: Electric Circuit Analysis

**UNIT - I INTRODUCTION 9**  
 Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

**UNIT - II ELECTRICAL AND ELECTRONICS INSTRUMENTS 9**  
 Classification of measuring instruments-Essential requirements of an instrument-Construction, working principle and Torque equation of Permanent Magnet Moving Coil instruments - Attraction type and Repulsion type Moving iron instruments-Electrodynamometer type Wattmeter, Extension of Voltmeter and Ammeter range - Construction, working principle of Instrument transformers-1 $\phi$  Induction type Energy meter.

**UNIT - III COMPARISON METHODS OF MEASUREMENTS 9**  
 D.C potentiometers - Crompton Potentiometer, D.C (Wheatstone, Kelvin, Kelvin double) bridges & A.C (Maxwell, Anderson, Hay’s, Wein & Schering) bridges, transformer ratio bridges, self-balancing bridges.

**UNIT - IV STORAGE AND DISPLAY DEVICES 9**  
 Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Elements of data acquisition system - Data Loggers.

**UNIT - V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9**  
 Classification of transducers – Selection of transducers – Resistive Transducer – Strain guage, Measurement of Temperature - RTD, thermister & thermocouple, Capacitive transducer - Inductive Transducers – Linear Variable Differential Transducer, Piezoelectric, Hall effect, optical and digital transducers — Smart sensors-Thermal Imagers, Power factor meter - Harmonic analyzer - Spectrum analyzer

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Compute the different statistical analysis on errors.
- Explain the concepts of fundamentals of electrical and electronic instruments
- Classify AC and DC bridges and formulate balance equation to calculate unknown resistance, inductance and capacitance.
- Discuss the interference and classify grounding techniques.
- Explain the various storage and display devices.
- Explain the construction and working of different types of transducer.

**TEXT BOOKS:**

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

**REFERENCES:**

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

**KLNCE UG EEE R2020 (AY 2022-2023)**

<b>20HS401</b>	<b>ENVIRONMENTAL SCIENCE AND ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL**

**LIST OF EXPERIMENTS:**

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

**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

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

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

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

**KLNCE UG EEE R2020 (AY 2022-2023)**

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

**OBJECTIVES:**

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

**PRE-REQUISITE:**

Course Code: 20EE301

Course Name: Digital Logic Circuits

**LIST OF EXPERIMENTS:**

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

**TOTAL: 45 PERIODS****OUTCOMES:****AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

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

**KLNCE UG EEE R2020 (AY 2022-2023)**

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

<b>S. No</b>	<b>Name of the equipments / Components</b>	<b>Quantity Required</b>	<b>Remarks</b>
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		

**KLNCE UG EEE R2020 (AY 2022-2023)****20EE4L3****TECHNICAL SEMINAR**

L	T	P	C
0	0	2	1

**OBJECTIVES:**

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

**PRE-REQUISITE: NIL****METHOD OF EVALUATION:**

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

**TOTAL: 30 PERIODS****OUTCOMES:****AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

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