1. **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**
   
   I. Find employment in Core Electrical and Electronics Engineering and service sectors.
   II. Get elevated to technical lead position and lead the organization competitively.
   III. Enter into higher studies leading to post-graduate and research degrees.
       Become consultant and provide solutions to the practical problems of core organization.
   IV. Become an entrepreneur and be part of electrical and electronics product and service industries.

2. **PROGRAMME OUTCOMES (POs):**

   After going through the four years of study, our Electrical and Electronics Engineering Graduates will exhibit ability to:

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<tr>
<th>PO#</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
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<tr>
<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
</tr>
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<td>2</td>
<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
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<tr>
<td>3</td>
<td>Design/development of solutions</td>
<td>Design an electrical system or process to improve its performance, satisfying its constraints.</td>
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<td>Conduct investigations of complex problems</td>
<td>Conduct experiments in electrical and electronics systems and interpret the data.</td>
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<td>5</td>
<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
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<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
</tr>
<tr>
<td>7</td>
<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
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<td>8</td>
<td>Ethics</td>
<td>Interacting industry, business and society in a professional and ethical manner.</td>
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<td>Individual and team work</td>
<td>Function in a multidisciplinary team.</td>
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<td>Proficiency in oral and written Communication.</td>
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<td>11</td>
<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
</tr>
<tr>
<td>12</td>
<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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3. PROGRAM SPECIFIC OUTCOMES (PSOs):

On completion of Electrical and Electronics Engineering program, the student will have the following Program Specific Outcomes.

1. **Foundation of Electrical Engineering**: Ability to understand the principles and working of electrical components, circuits, systems and control that are forming a part of power generation, transmission, distribution, utilization, conservation and energy saving. Students can assess the power management, auditing, crisis and energy saving aspects.

2. **Foundation of Mathematical Concepts**: Ability to apply mathematical methodologies to solve problems related with electrical engineering using appropriate engineering tools and algorithms.

3. **Computing and Research Ability**: Ability to use knowledge in various domains to identify research gaps and hence to provide solution which leads to new ideas and innovations.
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*Skill Based Course*

# NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

$ Skill Based Course
### SEMESTER III

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$ Skill Based Course

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$ NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.
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### PRACTICALS

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**TOTAL 21 0 7 28 21.5**

* Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

## SEMESTER VI

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<th>S. NO.</th>
<th>COURSE CODE</th>
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**TOTAL 21 0 3 24 19.5**

* Open Elective – I shall be chosen from the emerging technologies
* Mandatory Course-II is a Non-credit Course (Student Shall select one course from the list given under MC-II)

# NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA
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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.

**Elective - Management shall be chosen from the Elective Management Courses

***Open Elective III and IV (shall be chosen from the list of open electives offered by other Programmes).

<table>
<thead>
<tr>
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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.

**TOTAL CREDITS: 167**
### MANDATORY COURSES I

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<th>S. NO.</th>
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<tr>
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<td>MX3087</td>
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<td>4.</td>
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### ELECTIVE - MANAGEMENT COURSES

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<th>SL. NO.</th>
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### PROFESSIONAL ELECTIVE COURSES : VERTICALS

<table>
<thead>
<tr>
<th>Professional Elective</th>
<th>Vertical I Power Engineering</th>
<th>Vertical II Converters and Drives</th>
<th>Vertical III Embedded Systems</th>
<th>Vertical IV Electric Vehicle Technology</th>
<th>Vertical V Advanced Control</th>
<th>Vertical VI (Diversified Courses)</th>
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</thead>
<tbody>
<tr>
<td>2.</td>
<td>Under Ground Cable Engineering</td>
<td>Analysis of Electrical Machines</td>
<td>Embedded C-Programming</td>
<td>Design of Motor and Power Converters for Electric Vehicles</td>
<td>Computer Control of Processes</td>
<td>Hybrid Energy Technology</td>
</tr>
<tr>
<td>4.</td>
<td>HVD and FACTS</td>
<td>Electrical Drives</td>
<td>Embedded Control for Electrical Drives</td>
<td>Design of Electric Vehicle Charging System</td>
<td>Model Based Control</td>
<td>Grid integrating Techniques and Challenges</td>
</tr>
<tr>
<td>5.</td>
<td>Energy Management and Auditing</td>
<td>SMPS and UPS</td>
<td>Smart System Automation</td>
<td>Testing of Electric Vehicles</td>
<td>Non Linear Control</td>
<td>Sustainable and Environmental Friendly HV Insulation System</td>
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<tr>
<td>7.</td>
<td>Smart Grids</td>
<td>Control of Power Electronics Circuits</td>
<td>VLSI Design</td>
<td>Intelligent control of Electric Vehicles</td>
<td>Adaptive Control</td>
<td>PLC Programming</td>
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<tr>
<td>8.</td>
<td>Restructured Power Market</td>
<td>-</td>
<td>MEMS and NEMS</td>
<td>-</td>
<td>Machine Monitoring System</td>
<td>Big Data Analytics</td>
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<tr>
<td>9.</td>
<td>-</td>
<td>-</td>
<td>Digital Signal Processing System</td>
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**Registration of Professional Elective Courses from Verticals:**

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialisation / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2021, Clause 4.10.

Total number of courses per vertical may change in each programme of study as 6 or 7 or 8. If there is a shortage of courses in a vertical the same may be chosen from another vertical of the same programme.
## PROFESSIONAL ELECTIVE COURSES: VERTICALS

### VERTICAL I: POWER ENGINEERING

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<td>EE3003</td>
<td>Substation Engineering and Substation and Substation Automation</td>
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<td>Embedded Control for Electrical Drives</td>
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### VERTICAL IV: ELECTRIC VEHICLE TECHNOLOGY

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**OPEN ELECTIVES**
(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

**OPEN ELECTIVE I AND II**
(EMERGING TECHNOLOGIES)
To be offered other than Faculty of Information and Communication Engineering

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| 8.      | Mandatory Course (Non credit) | ✓ | ✓ |

**Enrollment for B.E. / B. Tech. (Honours) / Minor degree (Optional)**

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E./B.Tech. (Honours) Minor degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes. Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Complete details are available in clause 4.10 of Regulations 2021.
<table>
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<tr>
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<th>Vertical III</th>
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VERTICALS FOR MINOR DEGREE (In addition to all the verticals of other degree programmes)

VERTICALS FOR MINOR DEGREE
(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

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IP3151  INDUCTION PROGRAMME

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character."

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don't's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.
Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:
Guide to Induction program from AICTE
OBJECTIVES:
- To improve the communicative competence of learners
- To learn to use basic grammatic structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners’ ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

UNIT I INTRODUCTION TO EFFECTIVE COMMUNICATION
What is effective communication? (Explain using activities). Why is communication critical for excellence during study, research and work? What are the seven C’s of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION
Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II NARRATION AND SUMMATION
Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT
Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

UNIT IV CLASSIFICATION AND RECOMMENDATIONS
Reading – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc.,). Writing – Note-making / Note-taking (“Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal (chart, graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.
UNIT V EXPRESSION

Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

TOTAL: 45 PERIODS

LEARNING OUTCOMES:
At the end of the course, learners will be able
- To use appropriate words in a professional context
- To gain understanding of basic grammatic structures and use them in right context.
- To read and infer the denotative and connotative meanings of technical texts
- To write definitions, descriptions, narrations and essays on various topics

TEXT BOOKS:
1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
   Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCE BOOKS:

ASSESSMENT PATTERN
Two internal assessments and an end semester examination to test students’ reading and writing skills along with their grammatical and lexical competence.
OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I  MATRICES  9 + 3

UNIT II  DIFFERENTIAL CALCULUS  9 + 3

UNIT III  FUNCTIONS OF SEVERAL VARIABLES  9 + 3

UNIT IV  INTEGRAL CALCULUS  9 + 3
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 - Applications : Hydrostatic force and pressure, moments and centres of mass.

UNIT V  MULTIPLE INTEGRALS  9 + 3

TOTAL : 60 PERIODS

OUTCOMES:
At the end of the course the students will be able to
- Use the matrix algebra methods for solving practical problems.
• Apply differential calculus tools in solving various application problems.
• Able to use differential calculus ideas on several variable functions.
• Apply different methods of integration in solving practical problems.
• Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:
3. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8 ].

REFERENCES:

PH3151 ENGINEERING PHYSICS L T P C
3 0 0 3

OBJECTIVES:
• To make the students effectively to achieve an understanding of mechanics.
• To enable the students to gain knowledge of electromagnetic waves and its applications.
• To introduce the basics of oscillations, optics and lasers.
• Equipping the students to be successfully understand the importance of quantum physics.
• To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS 9
rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT II ELECTROMAGNETIC WAVES
The Maxwell’s equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS

UNIT IV BASIC QUANTUM MECHANICS
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch’s theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL : 45 PERIODS

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

- Understand the importance of mechanics.
- Express their knowledge in electromagnetic waves.
- Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
- Understand the importance of quantum physics.
- Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.

REFERENCES:
OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I WATER AND ITS TREATMENT


UNIT II NANO CHEMISTRY

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III PHASE RULE AND COMPOSITES

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule: Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.
UNIT IV FUELS AND COMBUSTION

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel.

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO₂ emission and carbon foot print.

UNIT V ENERGY SOURCES AND STORAGE DEVICES

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles-working principles; Fuel cells: H₂-O₂ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students will be able:
- To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To apply the knowledge of phase rule and composites for material selection requirements.
- To recommend suitable fuels for engineering processes and applications.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I  COMPUTATIONAL THINKING AND PROBLEM SOLVING                                          9

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS                                                  9
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS                                                    9
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES                                                            9
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

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; Illustrative programs: word count, copy file, Voter’s age validation, Marks range validation (0-100).

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and looping for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/

GE3152 HERITAGE OF TAMILS LT P C 1 0 0 1

UNIT I LANGUAGE AND LITERATURE

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE
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
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS
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

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-REFERENCE BOOKS
1. Social Life of Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
3. 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)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
5. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
TEXT-CUM-REFERENCE BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.)
3. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
4. 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)

GE3171 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C 0 0 4 2

OBJECTIVES:
- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:
Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter’s age validity, student mark range validation)
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS
OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems.
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/

BS3171    PHYSICS AND CHEMISTRY LABORATORY                              L  T  P  C
0  0  4  2

PHYSICS LABORATORY : (Any Seven Experiments)

OBJECTIVES:

• To learn the proper use of various kinds of physics laboratory equipment.
• To learn how data can be collected, presented and interpreted in a clear and concise manner.
• To learn problem solving skills related to physics principles and interpretation of experimental data.
• To determine error in experimental measurements and techniques used to minimize such error.
• To make the student as an active participant in each part of all lab exercises.
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young’s modulus
4. Uniform bending – Determination of Young’s modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Photoelectric effect
12. Michelson Interferometer.
13. Mende’s string experiment
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of the course, the students should be able to
- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze laboratory data.
- Use mathematical models as a medium for quantitative reasoning and describing physical reality.
- Access, process and analyze scientific information.
- Solve problems individually and collaboratively.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles

1. Preparation of $\text{Na}_2\text{CO}_3$ as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.
   - Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler’s method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration).
11. Estimation of iron content of the given solution using potentiometer.
13. Preparation of nanoparticles (TiO$_2$/ZnO/CuO) by Sol-Gel method.
15. Proximate analysis of Coal.

**TOTAL : 30 PERIODS**

**OUTCOMES:**
- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques.
- To analyse and determine the composition of alloys.
- To learn simple method of synthesis of nanoparticles.
- To quantitatively analyse the impurities in solution by electroanalytical techniques.

**TEXT BOOKS:**
OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic/work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students’ English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6

Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers-understanding basic instructions( filling out a bank application for example).

UNIT II NARRATION AND SUMMATION 6

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings-engaging in small talk-describing requirements and abilities.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT 6

Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.

UNIT IV CLASSIFICATION AND RECOMMENDATIONS 6

Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-

UNIT V EXPRESSION 6

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions- understanding a website-describing processes

TOTAL: 30 PERIODS
LEARNING OUTCOMES:
At the end of the course, learners will be able
- To listen and comprehend complex academic texts
- To speak fluently and accurately in formal and informal communicative contexts
- To express their opinions effectively in both oral and written medium of communication

ASSESSMENT PATTERN
- One online / app based assessment to test listening /speaking
- End Semester ONLY listening and speaking will be conducted online.
- Proficiency certification is given on successful completion of listening and speaking internal test and end semester exam.
OBJECTIVES:
- To engage learners in meaningful language activities to improve their reading and writing skills.
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

UNIT I  MAKING COMPARISONS  6
Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases.

UNIT II  EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING  6
Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint; Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds.

UNIT III  PROBLEM SOLVING  6
Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences.

UNIT IV  REPORTING OF EVENTS AND RESEARCH  6

UNIT V  THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY  6
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.

TOTAL : 30 PERIODS

OUTCOMES:
At the end of the course, learners will be able
- To compare and contrast products and ideas in technical texts.
- To identify cause and effects in events, industrial processes through technical texts.
- To analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.
- To report events and the processes of technical and industrial nature.
- To present their opinions in a planned and logical manner, and draft effective resumes in context of job search.
TEXT BOOKS:
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCE BOOKS:

ASSESSMENT PATTERN
Two internal assessments and an end semester examination to test students’ reading and writing skills along with their grammatical and lexical competence.

MA3251 STATISTICS AND NUMERICAL METHODS L T P C

OBJECTIVES:
- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9 + 3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9 + 3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design.
UNIT III    SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS                                9 + 3  

UNIT IV      INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION                                   9 +3  
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V         NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS               9 +3  

OUTCOMES:  
Upon successful completion of the course, students will be able to:
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:  

REFERENCES:  
OBJECTIVES:

- To make the students to understand the basics of dielectric materials and insulation.
- To understand the electrical properties of materials including free electron theory, applications of quantum mechanics and magnetic materials.
- To instil knowledge on physics of semiconductors, determination of charge carriers and device applications.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications.
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

UNIT I  DIELECTRIC MATERIALS AND INSULATION  9

UNIT II  ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS  9

UNIT III  SEMICONDUCTORS AND TRANSPORT PHYSICS  9

UNIT IV  OPTICAL PROPERTIES OF MATERIALS  9

UNIT V  NANO DEVICES  9
Density of states for solids - Significance between Fermi energy and volume of the material – Quantum confinement – Quantum structures – Density of states for quantum wells, wires and dots –
OUTCOMES:
At the end of the course, the students should be able to
- know basics of dielectric materials and insulation.
- gain knowledge on the electrical and magnetic properties of materials and their applications
- understand clearly of semiconductor physics and functioning of semiconductor devices
- understand the optical properties of materials and working principles of various optical devices
- appreciate the importance of nanotechnology and nanodevices.

TEXT BOOKS:

REFERENCES:

OBJECTIVES:
- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the Refrigeration & Air-conditioning system.
UNIT I PART A: OVERVIEW OF CIVIL ENGINEERING  
Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

UNIT I PART B: OVERVIEW OF MECHANICAL ENGINEERING  

UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS  

UNIT III BUILDING COMPONENTS AND INFRASTRUCTURE  

UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS  
Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM  

OUTCOMES:
CO1: Understanding profession of Civil and Mechanical engineering.  
CO2: Summarise the planning of building, infrastructure and working of Machineries.  
CO3: Apply the knowledge gained in respective discipline  
CO4: Illustrate the ideas of Civil and Mechanical Engineering applications.  
CO5: Appraise the material, Structures, machines and energy.

TEXT BOOKS:
1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018
REFERENCES:

GE3251 ENGINEERING GRAPHICS L T P C
2 0 4 4

OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Drawing engineering curves.
2. Drawing freehand sketch of simple objects.
3. Drawing orthographic projection of solids and section of solids.
4. Drawing development of solids
5. Drawing isometric and perspective projections of simple solids.

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 PLANE CURVES 6+12
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. 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 and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS AND FREEHAND SKETCHING 6+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6 +12
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the 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 cylinders and cones. Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)
UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

Principles of isometric projection — isometric scale — Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.
Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL: (L=30+P=60) 90 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to

• Use BIS conventions and specifications for engineering drawing.
• Construct the conic curves, involutes and cycloid.
• Solve practical problems involving projection of lines.
• Draw the orthographic, isometric and perspective projections of simple solids.
• Draw the development of simple solids.

TEXT BOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University 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.
OBJECTIVES:

- To introduce electric circuits and its analysis
- To provide key concepts to analyze and understand electrical circuits
- To impart knowledge on solving circuit equations using network theorems
- To educate on obtaining the transient response of circuits.
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of single & three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS


UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS

Network reduction: voltage and current division, source transformation—star delta conversion. Theorems—Superposition, Thevenin’s and Norton’s Theorem—Maximum power transfer theorem—Reciprocity Theorem—Millman’s theorem—Tellegen’s Theorem—Statement, application to DC and AC Circuits.

UNIT III TRANSIENT RESPONSE ANALYSIS


UNIT IV RESONANCE AND COUPLED CIRCUITS


UNIT V THREE PHASE CIRCUITS

Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and unbalanced—phasor diagram of voltages and currents—power measurement in three phase circuits—Power Factor Calculations.

OUTCOMES:

After completing this course, the students will be able to:

CO1: Explain circuit’s behavior using circuit laws.

CO2: Apply mesh analysis/nodal analysis/network theorems to determine behavior of the given DC and AC circuit.

CO3: Compute the transient response of first order and second order systems to step and sinusoidal input.

CO4: Compute power, line/phase voltage and currents of the given three phase circuit.

CO5: Explain the frequency response of series and parallel RLC circuits.

CO6: Explain the behavior of magnetically coupled circuits.

TOTAL: 60 PERIODS
TEXT BOOKS:

REFERENCES
NCC Credit Course Level 1*

NX3251  (ARMY WING) NCC Credit Course Level - I

L T P C
2 0 0 2

NCC GENERAL

NCC 1 Aims, Objectives & Organization of NCC 1
NCC 2 Incentives 2
NCC 3 Duties of NCC Cadet 1
NCC 4 NCC Camps: Types & Conduct 2

NATIONAL INTEGRATION AND AWARENESS

NI 1 National Integration: Importance & Necessity 1
NI 2 Factors Affecting National Integration 1
NI 3 Unity in Diversity & Role of NCC in Nation Building 1
NI 4 Threats to National Security 1

PERSONALITY DEVELOPMENT

PD 1 Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving 2
PD 2 Communication Skills 3
PD 3 Group Discussion: Stress & Emotions 2

LEADERSHIP

L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code 3
L 2 Case Studies: Shivaji, Jhasi Ki Rani 2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

SS 1 Basics, Rural Development Programmes, NGOs, Contribution of Youth 3
SS 4 Protection of Children and Women Safety 1
SS 5 Road / Rail Travel Safety 1
SS 6 New Initiatives 2
SS 7 Cyber and Mobile Security Awareness 1

TOTAL : 30 PERIODS
# NCC Credit Course Level 1*

**NX3252**  
(NAVAL WING) NCC Credit Course Level - I  
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## SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

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**TOTAL : 30 PERIODS**
UNIT I  WEAVING AND CERAMIC TECHNOLOGY  3
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

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 - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V  SCIENTIFIC TAMIL & TAMIL COMPUTING  3

TEXT-CUM-REFERENCE BOOKS
1. சமூக வாழ்க்கை – சமூகங்கள்: பொருளாதாரம் – சேவை, நைவல் (கல்விப் பொருள்: கல்வியுடைய பாடல்கள்: மாணவி செய்தி புயலை வெளியூறு கொண்டு புரட்சிக் குழுப்)
2. மக்களின் வாழ்க்கை – பங்களித்துக்குடு வாழ்க்கை. (கல்வியுடைய பொருள்)
3. கல்வி – தொல்லியல் விளக்கங்கள்: சாத்தகம் சுற்று பாதுகாப்பு (கல்வியுடைய சுற்று பாதுகாப்பு)
4. பொருளாதாரம் – அனுமான சுற்று பாதுகாப்பு. (சேவையுடைய சுற்று பாதுகாப்பு)
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
GE3252  

**Text-Cum-Reference Books**  

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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)

GE3271 ENGINEERING PRACTICES LABORATORY L T P C
0 0 4 2

OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:
1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:
a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:
a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:
   a) Studying joints in door panels and wooden furniture
   b) Studying common industrial trusses using models.

PART II  ELECTRICAL ENGINEERING PRACTICES  15

   a) Introduction to switches, fuses, indicators and lamps - Basic switchboard wiring with lamp, fan and three pin socket
   b) Staircase wiring
   c) Fluorescent Lamp wiring with introduction to CFL and LED types.
   d) Energy meter wiring and related calculations/ calibration
   e) Study of Iron Box wiring and assembly
   f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
   g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III  MECHANICAL ENGINEERING PRACTICES  15

WELDING WORK:
   a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
   b) Practicing gas welding.

BASIC MACHINING WORK:
   a) (simple)Turning.
   b) (simple)Drilling.
   c) (simple)Tapping.

ASSEMBLY WORK:
   a) Assembling a centrifugal pump.
   b) Assembling a household mixer.
   c) Assembling an airconditioner.

SHEET METAL WORK:
   a) Making of a square tray

FOUNDRY WORK:
   a) Demonstrating basic foundry operations.

PART IV  ELECTRONIC ENGINEERING PRACTICES  15

SOLDERING WORK:
   a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
   a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
a) Study an elements of smart phone.
b) Assembly and dismantle of LED TV.
c) Assembly and dismantle of computer/ laptop

TOTAL : 60 PERIODS

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

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

EE3271                        ELECTRIC CIRCUITS LABORATORY             L    T    P    C
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OBJECTIVES:
- To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- To gain practical experience on electric circuits and verification of theorems

LIST OF EXPERIMENTS
Familiarization of various electrical components, sources and measuring instruments
1. Simulation and experimental verification of series and parallel electrical circuit using fundamental laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin’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 validation of R-C,R-L and RLC electric circuit transients
7. Simulation and Experimental validation of frequency response of RLC electric circuit.
8. Design and implementation of series and parallel resonance circuit.
9. Simulation and experimental verification of three phase balanced and unbalanced star, delta networks circuit (Power and Power factor calculations).

TOTAL: 60 PERIODS

OUTCOMES:
- Use simulation and experimental methods to verify the fundamental electrical laws for the given DC/AC circuit (Ex 1)
• Use simulation and experimental methods to verify the various electrical theorems (Superposition, Thevenin, Norton and maximum power transfer) for the given DC/AC circuit (Ex 2-5)
• Analyze transient behavior of the given RL/RC/RLC circuit using simulation and experimental methods (Ex 6)
• Analyze frequency response of the given series and parallel RLC circuit using simulation and experimentation methods (Ex 7-8)
• Analyze the performance of the given three-phase circuit using simulation and experimental methods (Ex 9)

OBJECTIVES
• To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
• To be able to communicate effectively through writing.

UNIT I
Speaking: Role Play Exercises Based on Workplace Contexts, - talking about competition- discussing progress toward goals-talking about experiences- talking about events in life- discussing past events-
Writing: writing emails (formal & semi-formal).

UNIT II
Speaking: discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-
discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-
Writing: - writing different types of emails.

UNIT III
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios-
Writing: short essays and reports-formal/semi-formal letters.

UNIT IV
Speaking: discussing the natural environment-describing systems-describing position and movement-
explaining rules-(example- discussing rental arrangements)- understanding technical instructions-
Writing: writing instructions-writing a short article.

UNIT V
Speaking: describing things relatively-describing clothing-discussing safety issues( making recommendations) talking about electrical devices-describing controlling actions- Writing:
job application( Cover letter + Curriculum vitae)-writing recommendations.

TOTAL: 60 PERIODS
LEARNING OUTCOMES

- Speak effectively in group discussions held in a formal/semi formal contexts.
- Write emails and effective job applications.

Assessment Pattern

- One online / app based assessment to test speaking and writing skills
- Proficiency certification is given on successful completion of speaking and writing.

MA3303 PROBABILITY AND COMPLEX FUNCTIONS L T P C
3 1 0 4

OBJECTIVES

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in engineering problems.

UNIT I PROBABILITY AND RANDOM VARIABLES 9 + 3
Axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions – Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9 + 3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III ANALYTIC FUNCTIONS 9 + 3
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 $w = z + c$, $cz$, $\frac{1}{z}$, $z^2$ - Bilinear transformation.
UNIT IV  COMPLEX INTEGRATION  
9 + 3

UNIT V  ORDINARY DIFFERENTIAL EQUATIONS  
9 + 3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, students will be able to:
CO1: Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
CO2: Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
CO3: To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
CO4: To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
CO5: To acquaint the students with Differential Equations which are significantly used in engineering problems.

TEXT BOOKS

REFERENCES
OBJECTIVES:

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of
  - Electrostatic fields, electric 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

UNIT I   ELECTROSTATICS – I   12
Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields – Gradient, Divergence, Curl – theorems and applications - Coulomb’s Law – Electric field intensity – Field due to discrete and continuous charges – Gauss’s law and applications.

UNIT II  ELECTROSTATICS – II   12
Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson’s and Laplace’s equations, Capacitance, Energy density, Applications.

UNIT III  MAGNETOSTATICS   12
Lorentz force, magnetic field intensity (H) – Biot–Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV  ELECTRODYNAMIC FIELDS   12

UNIT V  ELECTROMAGNETIC WAVES   12
Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction.

COURSE OUTCOMES:
Upon the successful completion of the course, students will be able to:
CO1: Explain Gradient, Divergence, and Curl operations on electromagnetic vector fields.
CO2: Explain electrostatic fields, electric potential, energy density and their applications.
CO3: Calculate magneto static fields, magnetic flux density, vector potential
CO4: Explain different methods of emf generation and Maxwell’s equations
CO5: Explain the concept of electromagnetic waves and characterizing parameters

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TEXT BOOKS:


REFERENCES


SKILL DEVELOPMENT ACTIVITIES (Group Seminar / Mini Project / Assignment /Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc)

1. Data collection and Interpretation/discussion on electromagnetic field sources and their effects on human and environment and EMF exposure limits as per International Standards like IEEE, ICNIRP, etc.
2. Familiarization of any software tool like MATLAB to compute, visualize and analyze gradient, divergent and curl fields.
3. Familiarization of any EMF solvers to compute, visualize and analyze the Electric and Magnetic fields for configurations discussed in theory
4. Design and practical implementation of applications of electromagnetic fields like Van de Graaff generators, actuator, Magnetic levitation, Rail guns, Solenoid based applications, Faradays disk generator and metal detectors, wireless power transfer units etc. to improve the ability to implement the concepts studied.

REFERENCES FOR SKILL DEVELOPMENT ACTIVITIES
2. ICNIRP guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz).
3. IEEE C 95.6 -2002 IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz
4. IEEE C95.1-2019 - IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
5. Measurements and predictions of electric and magnetic fields from power lines Charalambos P. Nicolaoua, Antonis P. Papadakisb, Panos A. Razisa, George A. Kyriacouc, John N. Sahalosd.

EE3302                              DIGITAL LOGIC CIRCUITS                             L T P C
                                          3 0 0 3

COURSE OBJECTIVES:

- To introduce the fundamentals of combinational and sequential digital circuits.
- To study various number systems and to simplify the mathematical expressions using Boolean functions word problems
- To study implementation of combinational circuits using Gates’ and MSI Devices.
- To study the design of various synchronous and asynchronous circuits
- To introduce digital simulation techniques for development of application oriented logic circuit
UNIT I  NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES  9
Number system, error detection, corrections & codes conversions, Boolean algebra: De-
Morgan’s theorem, switching functions and minimization using K-maps & Quine McCluskey
method - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -
operation, characteristics of digital logic family.

UNIT II  COMBINATIONAL CIRCUITS  9
Combinational logic - representation of logic functions-SOP and POS forms, K-map
representations - minimization using K maps - simplification and implementation of
combinational logic – multiplexers and de multiplexers - code converters, adders,
subtractors, Encoders and Decoders.

UNIT III  SYNCHRONOUS SEQUENTIAL CIRCUITS  9
Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters -
asynchronous and synchronous type - Modulo counters - Shift registers - design of
synchronous sequential circuits – Moore and Mealy models- Counters, state diagram; state
reduction; state assignment.

UNIT IV  ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY  9
LOGIC DEVICES
Asynchronous sequential logic Circuits-Transition stability, flow stability-race conditions,
hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits-
introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V  VHDL  9
RTL Design – combinational logic – Sequential circuit – Operators – Introduction to
Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters,
flip flops, Multiplexers & De multiplexers).

TOTAL: 45 PERIODS

Course Outcomes:
Upon the successful completion of the course, students will be able to:
CO1: Explain various number systems and characteristics of digital logic families
CO2: Apply K-maps and Quine McCluskey methods to simplify the given Boolean
expressions
CO3: Explain the implementation of combinational circuit such as multiplexers and de
multiplexers - code converters, adders, subtractors, Encoders and Decoders
CO4: Design various synchronous and asynchronous circuits using Flip Flops
CO5: Explain asynchronous sequential circuits and programmable logic devices
CO6: Use VHDL for simulating and testing RTL, combinatorial and sequential circuits

TEXTBOOKS:

REFERENCES:
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EC3301 ELECTRON DEVICES AND CIRCUITS L T P C
3 0 0 3

COURSE OBJECTIVES:

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

UNIT I PN JUNCTION DEVICES

UNIT II TRANSISTORS AND THYRISTORS
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.

UNIT III AMPLIFIERS
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS
**COURSE OUTCOMES:**

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

**CO1:** Explain the structure and operation of PN junction devices (diode, Zener diode, LED and Laser diode)

**CO2:** Design clipper, clamper, half wave and full wave rectifier, regulator circuits using PN junction diodes

**CO3:** Analyze the structure and characteristics BJT, FET, MOSFET, UJT, Thyristor and IGBT

**CO4:** Analyze the performance of various configurations of BJT and MOSFET based amplifier

**CO5:** Explain the characteristics of MOS based cascade and differential amplifier

**CO6:** Explain the operation of various feedback amplifiers and oscillators

**TEXT BOOKS:**


**REFERENCES:**


**Mapping COs and POs:**

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**TOTAL: 45 PERIODS**
COURSE OBJECTIVES:
- To understand the concept of electromechanical energy conversion system.
- To identify the appropriate machine for a given application based on its characteristics.
- To identify the appropriate test to determine the performance parameters of a given machine.
- To familiarize with the procedure for parallel operation of generators and transformers.
- To deliberate the working of auto transformer and three phase transformers.

UNIT I  ELECTROMECHANICAL ENERGY CONVERSION  9
Fundamentals of Magnetic circuits- Statically and dynamically induced EMF - Principle of electromechanical energy conversion forces and torque in magnetic field systems- energy balance in magnetic circuits- magnetic force- co-energy in singly excited and multi excited magnetic field system mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines- magnetic saturation and leakage fluxes. Introduction to Indian Standard Specifications (ISS) - Role and significance in testing.

UNIT II  DC GENERATORS  9
Principle of operation, constructional details, armature windings and its types, EMF equation, wave shape of induced emf, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, interpoles, OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, equalizing connections- applications of DC Generators.

UNIT III  DC MOTORS  9
Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, load characteristics of DC motors, losses and efficiency in DC machine, condition for maximum efficiency. Testing of DC Machines: Brake test, Swinburne’s test, Hopkinson's test, Field test, Retardation test, Separation of core losses-applications of DC motors.

UNIT IV  SINGLE PHASE TRANSFORMER  9
Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, all day efficiency, back-to-back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer.

UNIT V  AUTOTRANSFORMER AND THREE PHASE TRANSFORMER  9
Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer. Three Phase Transformer- Construction, types of connections and their comparative features, Scott connection, applications of Scott connection.
TEXT BOOKS

REFERENCES

COURSE OUTCOMES:
At the end of the course students will be able to:
CO1: Apply the laws governing the electromechanical energy conversion for singly and multiple excited systems.
CO2: Explain the construction and working principle of DC machines.
CO3: Interpret various characteristics of DC machines.
CO4: Compute various performance parameters of the machine, by conducting suitable tests.
CO5: Draw the equivalent circuit of transformer and predetermine the efficiency and regulation.
CO6: Describe the working principle of auto transformer, three phase transformer with different types of connections.

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COURSE OBJECTIVES:

- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADTs and linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

UNIT I  C PROGRAMMING FUNDAMENTALS (8+1 SKILL)
9

UNIT II  C PROGRAMMING - ADVANCED FEATURES (8+1 SKILL)
9

UNIT III  LINEAR DATA STRUCTURES (8+1 SKILL)
9

UNIT IV  NON-LINEAR DATA STRUCTURES (8+1 SKILL)
9

UNIT V  SORTING AND SEARCHING TECHNIQUES (8+1 SKILL)
9
Insertion Sort – Quick Sort – Heap Sort – Merge Sort – Linear Search – Binary Search.

TOTAL: 45 PERIODS

SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc) 5

COURSE OUTCOMES:

CO1 Develop C programs for any real world/technical application.
CO2 Apply advanced features of C in solving problems.
CO3 Write functions to implement linear and non–linear data structure operations.
CO4 Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.
CO5 Appropriately use sort and search algorithms for a given application.
CO6 Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.
TEXT BOOKS:

REFERENCES:

List of Open Source Software/ Learning website:
https://www.coursera.org/specializations/data-structures-algorithms
https://nptel.ac.in/courses/112107243
https://nptel.ac.in/courses/112105598

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1-low, 2-medium, 3-high, '-' - no correlation
COURSE OBJECTIVES:
- To enable the students to understand the behavior of semiconductor device based on experimentation.
- Be exposed to active and passive circuit elements.
- Familiarize the operation and characteristics of transistor like BJT and FET.
- Explore the characteristics of amplifier gain and frequency response.
- Learn the required functionality of positive and negative feedback systems.

LIST OF EXPERIMENTS
1. Characteristics of Semiconductor diode, Zener diode, photo diode, and photo transistor,
2. Characteristics of NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET and draw the equivalent circuit
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and frequency response characteristics of a Common Emitter amplifier
6. Characteristics of light activated relay circuit
7. Design and testing of RC phase shift and LC oscillators
8. Characteristics of Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
10. Measurement of frequency and phase angle using CRO
11. Realization of passive filters

COURSE OUTCOMES:
Upon successful completion of the course, the students will be able to:
CO1: Analyze the characteristics of PN, Zener diode and BJT in CE, CC, CB configurations experimentally
CO2: Analyze the characteristics of JFET and UJT experimentally
CO3: Analyze frequency response characteristics of a Common Emitter amplifier experimentally
CO4: Analyze the characteristics of RC phase shift and LC oscillators experimentally
CO5: Analyze the characteristics of half-wave and full-wave rectifier with and without filters experimentally
CO6: Analyze the characteristics of FET based differential amplifier experimentally
CO7: Calculate the frequency and phase angle using CRO experimentally
CO8: Analyze the frequency response characteristics of passive filters experimentally

TOTAL : 45 PERIODS
COURSE OBJECTIVES:
- To expose the students to determine the characteristics of DC machines and transformers by performing experiments on these machines.
- To provide hands on experience to evaluate the performance parameters of DC machines and transformer by conducting suitable tests.

LIST OF EXPERIMENTS:
1. Open circuit and load characteristics of DC shunt generator- calculation of critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne’s test and speed control of DC shunt motor.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner’s test on single phase transformers.
12. Study of starters and 3-phase transformers connections.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course students will be able to:
CO1: Construct the circuit with appropriate connections for the given DC machine/transformer.
CO2: Experimentally determine the characteristics of different types of DC machines.
CO3: Demonstrate the speed control techniques for a DC motor for industrial applications.
CO4: Identify suitable methods for testing of transformer and DC machines.
CO5: Predetermine the performance parameters of transformers and DC motor.
CO6: Understand DC motor starters and 3-phase transformer connections.

Mapping COs and POs:

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CS3362 C PROGRAMMING AND DATA STRUCTURES LABORATORY L T P C 0 0 3 1.5

COURSE OBJECTIVES:
- To develop applications in C
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS
1. Practice of C programming using statements, expressions, decision making and iterative statements
2. Practice of C programming using Functions and Arrays
3. Implement C programs using Pointers and Structures
4. Implement C programs using Files
5. Development of real time C applications
6. Array implementation of List ADT
7. Array implementation of Stack and Queue ADTs
8. Linked list implementation of List, Stack and Queue ADTs
9. Applications of List, Stack and Queue ADTs

75
10. Implementation of Binary Trees and operations of Binary Trees
11. Implementation of Binary Search Trees
12. Implementation of searching techniques
13. Implementation of Sorting algorithms: Insertion Sort, Quick Sort, Merge Sort

TOTAL: 45 PERIODS

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

CO1 Use different constructs of C and develop applications
CO2 Write functions to implement linear and non-linear data structure operations
CO3 Suggest and use the appropriate linear / non-linear data structure operations for a given problem
CO4 Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval
CO5 Implement Sorting and searching algorithms for a given application

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1-low, 2-medium, 3-high, ‘-‘- no correlation
OBJECTIVES:
To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.

- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.

- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered.

- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD:
Create and format a document
Working with tables
Working with Bullets and Lists
Working with styles, shapes, smart art, charts
Inserting objects, charts and importing objects from other office tools
Creating and Using document templates
Inserting equations, symbols and special characters
Working with Table of contents and References, citations
Insert and review comments
Create bookmarks, hyperlinks, endnotes footnotes
Viewing document in different modes
Working with document protection and security
Inspect document for accessibility

MS EXCEL:
Create worksheets, insert and format data
Work with different types of data: text, currency, date, numeric etc.
Split, validate, consolidate, Convert data
Sort and filter data
Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
Work with Lookup and reference formulae
Create and Work with different types of charts
Use pivot tables to summarize and analyse data
Perform data analysis using own formulae and functions
Combine data from multiple worksheets using own formulae and built-in functions to generate results
Export data and sheets to other file formats
Working with macros
Protecting data and Securing the workbook
MS POWERPOINT:                    10 Hours
Select slide templates, layout and themes
Formatting slide content and using bullets and numbering
Insert and format images, smart art, tables, charts
Using Slide master, notes and handout master
Working with animation and transitions
Organize and Group slides
Import or create and use media objects: audio, video, animation
Perform slideshow recording and Record narration and create presentable videos

TOTAL: 30 PERIODS

OUTCOMES:
On successful completion the students will be able to
- Use MS Word to create quality documents, by structuring and organizing content for their
day to day technical and academic requirements
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per
requirements and visualize data for ease of understanding
- Use MS PowerPoint to create high quality academic presentations by including common
tables, charts, graphs, interlinking other elements, and using media objects.

GE3451       ENVIRONMENTAL SCIENCES AND SUSTAINABILITY       L   T    P    C
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UNIT I       ENVIRONMENT AND BIODIVERSITY                6
Definition, scope and importance of environment – need for public awareness. Eco-system and
Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity–
values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to
biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic
species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II     ENVIRONMENTAL POLLUTION                          6
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions.
Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety
Management system (OHASMS). Environmental protection, Environmental protection acts .

UNIT III    RENEWABLE SOURCES OF ENERGY                       6
Energy management and conservation, New Energy Sources: Need of new sources. Different types
new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy
conversion. Concept, origin and power plants of geothermal energy.
UNIT IV  SUSTAINABILITY AND MANAGEMENT

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

UNIT V  SUSTAINABILITY PRACTICES


TEXT BOOKS:

5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

REFERENCES

COURSE OBJECTIVES:

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

UNIT I  TRANSMISSION LINE PARAMETERS
Structure of electric 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 - Typical configuration, conductor types - Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD; skin and proximity effects - Effects of earth on the capacitance of the transmission line - interference with neighboring communication circuits.

UNIT II  MODELLING AND PERFORMANCE OF TRANSMISSION LINES
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 – Ferranti effect – Formation of Corona – Critical Voltages – Effect on line Performance.

UNIT III  SAG CALCULATION AND LINE SUPPORTS
Mechanical design of overhead lines – Line Supports – Types of towers – Tension and Sag Calculation for different weather conditions – Methods of grounding - Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV  UNDERGROUND CABLES

UNIT V  DISTRIBUTION SYSTEMS

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCE BOOKS:

COURSE OUTCOMES
On the successful completion of the course, students will be able to:
CO1: Understand the structure of power system, computation of transmission line parameter for different configurations and the impact of skin and proximity effects.
CO2: Model the transmission lines to determine the line performance and to understand the impact of Ferranti effect and corona on line performance.
CO3: Do Mechanical design of transmission lines, grounding and to understand about the insulators in transmission system.
CO4: Design the underground cables and understand the performance analysis of underground cable.
CO5: Understand the modelling, performance analysis and modern trends in distribution system.

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81
COURSE OBJECTIVES:
To impart knowledge on the following topics
- Signal analysis using Op-amp based circuits.
- Applications of Op-amp.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- IC fabrication procedure.

UNIT I  IC FABRICATION  9
IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, FETs and PV Cell.

UNIT II  CHARACTERISTICS OF OPAMP  9
Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Voltage-shunt feedback and inverting amplifier - Voltage series feedback: and Non-Inverting Amplifier - Basic applications of op-amp - , summer, differentiator and Integrator-V/I & I/V converters.

UNIT III  APPLICATIONS OF OPAMP  9
Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers- Analog multiplier & Divider, first and second order active filters, comparators, multi vibrators, waveform generators, clippers, clampers, peak detector, S/H circuit- D/A converter (R- 2R ladder and weighted resistor types), A/D converters using OP-AMPS.

UNIT IV  SPECIAL ICs  9
Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlled oscillator IC; 565-phase locked loop IC, AD633 Analog multiplier ICs.

UNIT V  APPLICATION ICs  9
AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators; switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL :45 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, the students will be able to:
CO1 Explain monolithic IC fabrication process
CO2 Explain the fabrication of diodes, capacitance, resistance, FETs and PV Cell.
CO3 Analyze the characteristics and basic applications (inverting/non-inverting amplifier, summer, differentiator, integrator, V/I and I/V converter) of Op-Amp
CO4 Explain circuit and applications of op-amp based instrumentation amplifier, log/antilog amplifier, analog multiplier /divider, active filters, comparators, waveform generators, A/D and D/A
converters

CO5  Explain Functional blocks, characteristics and applications of Timer, PLL, analog multiplier ICs.
CO6  Explain the applications of ICs in Instrumentation amplifier, fixed and variable voltage regulator, SMPS and function generator

TEXT BOOKS:

REFERENCES

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COURSE OBJECTIVES

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

UNIT I CONCEPTS OF MEASUREMENTS
Instruments: classification, applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement -Statistical evaluation of measurement data.

UNIT II MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS

UNIT III AC/DC BRIDGES AND INSTRUMENTATION AMPLIFIERS

UNIT IV TRANSDUCERS FOR MEASUREMENT OF NON-ELECTRICAL PARAMETERS

UNIT V DIGITAL INSTRUMENTATION

COURSE OUTCOMES:
Upon successful completion of the course, the students should have the:
CO1: Ability to understand the fundamental art of measurement in engineering.
CO2: Ability to understand the structural elements of various instruments.
CO3: Ability to understand the importance of bridge circuits.
CO4: Ability to understand about various transducers and their characteristics by experiments.
CO5: Ability to understand the concept of digital instrumentation and virtual instrumentation by experiments.

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EE3404 MICROPROCESSOR AND MICROCONTROLLER

COURSE OBJECTIVES:
- To study the addressing modes & instruction set of 8085 &8051
- To develop skills in simple program writing in assembly languages
- To introduce commonly used peripheral/interfacing ICs.
- To study and understand typical applications of micro-processors.
- To study and understand the typical applications of micro-controllers

UNIT I INTRODUCTION TO 8085 ARCHITECTURE

UNIT II 8085 INSTRUCTION SET AND PROGRAMMING
Instruction format and addressing modes — Assembly language format — Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions, stack.

UNIT III INTERFACING BASICS AND ICs
Study of Architecture and programming of ICs: 8255 PPI, 8259PIC, 8251USART, 8279 Keyboard display controller and 8254 Timer/Counter – Interfacing with 8085 -A/D and D/A converter interfacing.

UNIT IV INTRODUCTION TO 8051 MICROCONTROLLER
Functional block diagram - Instruction format and addressing modes – Interrupt structure – Timer – I/O ports – Serial communication, Simple programming –keyboard and display interface –
Temperature control system –stepper motor control - Usage of IDE for assembly language programming.

UNIT V  INTRODUCTION TO RISC BASED ARCHITECTURE

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, the students should have the:
CO1: Ability to write assembly language program for microprocessor and microcontroller
CO2: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller
CO3: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring.
CO4: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.
CO5: Ability to understand and appreciate advanced architecture evolving microprocessor field

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COURSE OBJECTIVES:

To impart knowledge on the following Topics

- Construction and performance of salient and non-salient type synchronous generators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I  SYNCHRONOUS GENERATOR  9

UNIT II  SYNCHRONOUS MOTOR  9

UNIT III  THREE PHASE INDUCTION MOTOR  9

UNIT IV  STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR  9

UNIT V  SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Ability to understand the construction and working principle of Synchronous generator
CO2: Ability to understand the construction and working principle of Synchronous Motor
CO3: Ability to understand the construction and working principle of Three Phase Induction Motor
CO4: Acquire knowledge about the starting and speed control of induction motors.
CO5: To gain knowledge about the basic principles and working of Single phase induction motors and Special Electrical Machines.

TEXT BOOKS:

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COURSE OBJECTIVES:
- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS
1. Regulation of three phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF and ASA methods.
3. Regulation of three phase salient pole alternator by slip test.
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
10. No load and blocked rotor test on single-phase induction motor.
11. Study of Induction Motor Starters

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student should have the:
CO1: Ability to understand and analyze EMF and MMF methods
CO2: Ability to analyze the characteristics of V and Inverted V curves
CO3: Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods. to understand the importance of Synchronous machines
CO4: Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods. to understand the importance of single and three phase Induction motors
CO5: Ability to acquire knowledge on separation of losses

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COURSE OBJECTIVES:
- To learn design, testing and characterizing of circuit behavior with combinational logic gate ICs.
- To learn design, testing and characterizing of circuit behavior with register/counter and sequential logic ICs.
- To learn design, testing and characterizing of circuit behavior with OPAMP ICs.
- To learn design, testing and characterizing of circuit behavior with analog ICs like 555 timer VCO and regulators.
- To learn design, testing and characterizing of circuit behavior with digital ICs like decoders, multiplexers.

LIST OF EXPERIMENTS
1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa.
3. Parity generator and parity checking.
4. Encoders and Decoders.
5. Counters: Design and implementation of 3-bit modulo counters as synchronous and asynchronous types using FF IC’s and specific counter IC.
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC’s.
7. Study of multiplexer and de multiplexer.
8. Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.
10. Voltage to frequency characteristics of NE/SE 566 IC.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student should have the:
CO1: Ability to understand and implement Boolean Functions.
CO2: Ability to understand the importance of code conversion.
CO3: Ability to Design and implement circuits with digital ICs like decoders, multiplexers, register.
CO4: Ability to acquire knowledge on Application of Op-Amp.
CO5: Ability to Design and implement counters using analog ICs like timers, VCOs and digital ICs like Flip-flops and counters.

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COURSE OBJECTIVES:
• To perform simple arithmetic operations using assembly language program and study the addressing modes & instruction set of 8085 & 8051
• To develop skills in simple program writing in assembly languages
• To write an assembly language program to convert Analog input to Digital output and Digital input to Analog output.
• To perform interfacing experiments with µP8085
• To perform interfacing experiments with µC8051.

PROGRAMMING EXERCISES / EXPERIMENTS WITH µP8085:
1. Simple arithmetic operations: Multi precision addition / subtraction /multiplication / division.
3. Interface Experiments: A/D Interfacing, D/A Interfacing, Traffic light controller
5. Displaying a moving/ rolling message in the student trainer kit’s output device.

PROGRAMMING EXERCISES / EXPERIMENTS WITH µC8051:
8. Interface Experiments: A/D Interfacing, D/A Interfacing, Traffic light controller
10. Displaying a moving/ rolling message in the student trainer kit’s output device.
11. Programming PIC architecture with software tools.

COURSE OUTCOMES:
After studying the above subject, students should have the:
CO1: Ability to write assembly language program for microprocessor.
CO2: Ability to write assembly language program for microcontroller
CO3: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller
CO4: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring.
CO5: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.
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