I. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)
1. To provide the students with a strong foundation in the required sciences in order to pursue studies in Electronics and Communication Engineering.
2. To gain adequate knowledge to become good professional in electronic and communication engineering associated industries, higher education and research.
3. To develop attitude in lifelong learning, applying and adapting new ideas and technologies as their field evolves.
4. To prepare students to critically analyze existing literature in an area of specialization and ethically develop innovative and research oriented methodologies to solve the problems identified.
5. To inculcate in the students a professional and ethical attitude and an ability to visualize the engineering issues in a broader social context.

II. PROGRAM OUTCOMES (POs)
1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering
solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

### III. PROGRAM SPECIFIC OUTCOMES (PSOs)

- **PSO1:** Design, develop and analyze electronic systems through application of relevant electronics, mathematics and engineering principles
- **PSO2:** Design, develop and analyze communication systems through application of fundamentals from communication principles, signal processing, and RF System Design & Electromagnetics.
- **PSO3:** Adapt to emerging electronics and communication technologies and develop innovative solutions for existing and newer problems

**PEOs(1 to 5) mapped with POs and PSOs**

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⁶ Skill Based Course

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⁶ 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.

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

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*Open Elective – I Shall be chosen from the list of open electives offered by other Programmes

* Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-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
<table>
<thead>
<tr>
<th>S. NO.</th>
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<th>COURSE TITLE</th>
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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.

** Open Elective II - IV (Shall be chosen from the list of open electives offered by other Programmes).

* Elective - Management shall be chosen from the Elective Management courses.

---

**SEMESTER VIII / VII**

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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 : 162**

**ELECTIVE – MANAGEMENT COURSES**

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### MANDATORY COURSES I

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<tr>
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### MANDATORY COURSES II

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<tr>
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<td>4.</td>
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<td>State, Nation Building and Politics in India</td>
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### PROFESSIONAL ELECTIVE COURSES: VERTICALS

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<thead>
<tr>
<th>Vertical I</th>
<th>Vertical II</th>
<th>Vertical III</th>
<th>Vertical IV</th>
<th>Vertical V</th>
<th>Vertical VI</th>
<th>Vertical VII</th>
<th>Vertical VIII</th>
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<tbody>
<tr>
<td>Wide Bandgap Devices</td>
<td>Advanced Digital Signal Processing</td>
<td>RF Transceivers</td>
<td>Wearable Devices</td>
<td>Underwater Instrumentation System</td>
<td>IoT Processors</td>
<td>Radar Technologies</td>
<td>Optical Communication &amp; Networks</td>
</tr>
<tr>
<td>Validation and Testing Technology</td>
<td>Image Processing</td>
<td>Signal Integrity</td>
<td>Human Assist Devices</td>
<td>Underwater Imaging Systems and Image Processing</td>
<td>IoT Based System Design</td>
<td>Avionics Systems</td>
<td>Wireless Broad Band Networks</td>
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<tr>
<td>VLSI Testing and Design For Testability</td>
<td>Software Defined Radio</td>
<td>MICs and RF System Design</td>
<td>Medical Imaging Systems</td>
<td>Ocean Observation Systems</td>
<td>Industrial IoT and Industry 4.0</td>
<td>Satellite Communication</td>
<td>Software Defined Networks</td>
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<tr>
<td>Analog IC Design</td>
<td>Computer Vision</td>
<td>RF ID System Design &amp; Testing</td>
<td>Body Area Networks</td>
<td>Ocean Acoustics</td>
<td>Fundamentals of Nanoelectronics</td>
<td>Rocketry and Space Mechanics</td>
<td>Advanced Wireless Communication Techniques</td>
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</tbody>
</table>

**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.
## PROFESSIONAL ELECTIVE COURSES: VERTICALS

### VERTICAL 1: SEMICONDUCTOR CHIP DESIGN AND TESTING

<table>
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<tr>
<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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<tr>
<td>1.</td>
<td>CEC363</td>
<td>Wide Bandgap Devices</td>
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### Vertical 7: Space Technologies

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SUMMARY

Name of the Programme: B.E. Electronics and Communication Engineering

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Total | 22 | 26 | 25 | 22 | 21 | 20 | 16 | 10 | 162

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) or 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.
# VERTICALS FOR MINOR DEGREE
(In addition to all the verticals of other programmes)

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<td>Public Personnel Administration</td>
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(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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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 dont'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 1 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 grammatical 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)
2. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

**REFERENCES:**

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

**MA3151 MATRICES AND CALCULUS**

**COURSE OBJECTIVES:**
- To develop the use of matrix algebra techniques that are 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**
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal

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

COURSE 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:
COURSE OBJECTIVES:

- To make the students effectively 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 successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I  MECHANICS 9

UNIT II  ELECTROMAGNETIC WAVES 9
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 9

UNIT IV  BASIC QUANTUM MECHANICS 9
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

COURSE 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:

CY3151
ENGINEERING CHEMISTRY

COURSE 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

Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination

UNIT II NANOchemistRy
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

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

COURSE 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:

GE3151 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
3 0 0 3

COURSE 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**

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**

Files and exceptions: 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).

**COURSE 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 loops 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/
UNIT I  LANGUAGE AND LITERATURE

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

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 Tamil - 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. தமிழக வரலொறு – மக்களும் பண் பொடும் – ககக.கக.பிள்ளள (தவளியீடு: கருணையின் பராகின் மாதிர் கல்லூரியில் தமிழக காலம்). 
2. கல்லறிந்த வரலொறு – பட்னாமின் விளையாட்டு (தித்தின் பிரசுரம்).
3. இந்தமானம் – கைவெளிக்கும் கல்களக் கால தகுதி (ததொல்லியல் துளறதவளியீடு).
4. பாரம்பரிய – குறிஞ்சிகள் தரகுமிகள் (ததொல்லியல் துளறதவளியீடு).
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:
Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)

Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.
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)
5. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
6. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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)
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

COURSE 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)

COURSE 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 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 wavelength 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. Melde’s string experiment
   14. Experiment with lattice dynamics kit.

COURSE 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.

TOTAL: 30 PERIODS

41
CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

COURSE 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 a 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.
12. Estimation of sodium/potassium present in water using a flame photometer.
13. Preparation of nanoparticles (TiO$_2$/ZnO/CuO) by Sol-Gel method.
15. Proximate analysis of Coal.

TOTAL : 30 PERIODS

COURSE 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:

GE3172 ENGLISH LABORATORY

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
3 1 0 4

COURSE 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
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
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
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

COURSE 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:

PH3254  PHYSICS FOR ELECTRONICS ENGINEERING  L  T  P  C  3  0  0  3

COURSE OBJECTIVES:
- To make the students to understand the basics of crystallography and its importance in studying materials properties.
- 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  CRYSTALLOGRAPHY

UNIT II  ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

UNIT III  SEMICONDUCTORS AND TRANSPORT PHYSICS

UNIT IV  OPTICAL PROPERTIES OF MATERIALS

UNIT V  NANO DEVICES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students should be able to
- know basics of crystallography and its importance for varied materials properties
● 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:

BE3254 ELECTRICAL AND INSTRUMENTATION ENGINEERING L T P C
3 0 0 3

COURSE OBJECTIVES :
- To impart knowledge in types, construction and working of transformers
- To impart knowledge in types, construction and working of DC machines
- To impart knowledge in types, construction and working of AC rotating machines
- To introduce the functional elements and working of measuring instruments.
- To introduce the basics of power system and protection schemes

UNIT I TRANSFORMER

UNIT II DC MACHINES
Introduction – Constructional Features – Motor and Generator mode - EMF and Torque equation – Circuit Model – Methods of Excitation- Characteristics – Starting and Speed Control – Universal Motor- Stepper Motors – Brushless DC Motors- Applications

UNIT III AC ROTATING MACHINES
UNIT IV  MEASUREMENTS AND INSTRUMENTATION  9

UNIT V  BASICS OF POWER SYSTEMS  9
Power system structure - Generation, Transmission and distribution, Various voltage levels, Earthing – methods of earthing, protective devices- switch fuse unit- Miniature circuit breaker- moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completing this course, the students will be able to
CO1: Explain the working principle of electrical machines
CO2: Analyze the output characteristics of electrical machines
CO3: Choose the appropriate electrical machines for various applications
CO4: Explain the types and operating principles of measuring instruments
CO5: Explain the basic power system structure and protection schemes

TEXT BOOKS:

REFERENCES:

GE3251  ENGINEERING GRAPHICS  L T P C
2  0 4  4

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
• Drawing engineering curves.
• Drawing freehand sketch of simple objects.
• Drawing orthographic projection of solids and section of solids.
• Drawing development of solids
• 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
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**  
6+12
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**

**COURSE 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 BOOKS:**

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.

EC3251 CIRCUIT ANALYSIS

L T P C
3 1 0 4

COURSE OBJECTIVES:
- To learn the basic concepts and behaviour of DC and AC circuits.
- To understand various methods of circuit/ network analysis using network theorems.
- To understand the transient and steady state response of the circuits subjected to DC excitations and AC with sinusoidal excitations.
- To learn the concept of coupling in circuits and topologies.

UNIT I DC CIRCUIT ANALYSIS
12
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff’s Current Law, Kirchoff’s voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.
UNIT II  NETWORK THEOREM AND DUALITY  12
Useful Circuit Analysis techniques - Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Duals, Dual circuits. Analysis using dependent current sources and voltage sources

UNIT III  SINUSOIDAL STEADY STATE ANALYSIS  12

UNIT IV  TRANSIENTS AND RESONANCE IN RLC CIRCUITS  12

UNIT V  COUPLED CIRCUITS AND TOPOLOGY  12
Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

SUGGESTED ACTIVITIES:
- Practice solving variety of problems

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

CO1: Apply the basic concepts of circuit analysis such as Kirchoff's laws, mesh current and node voltage method for analysis of DC and AC circuits.
CO2: Apply suitable network theorems and analyze AC and DC circuits
CO3: Analyze steady state response of any R, L and C circuits
CO4: Analyze the transient response for any RC, RL and RLC circuits and frequency response of parallel and series resonance circuits.
CO5: Analyze the coupled circuits and network topologies

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழக வரலை – காலகத்திய பலகைணி (தமிழ்நூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கல்விமிக்க காலம் - சம்பந்த தொலைத் தொலைத்தொலைத் (தின்பகுதி பிரசுரம்).
3. கீழடி – சட்டக தகவல்களின் சம்பந்தக் கால தொன்றிகள் (தகவலியியல் துளறைல் பிரசுரம்).
4. மட்டுமே - முக்கோள் முனைந்த முனைந்த (தகவலியியல் துளறைல் பிரசுரம்).
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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

GE3252

தமிழ் மதொழில்நுட்பம்

L T P C

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அலகு I  நான்குமாதிரி பாண்டிய தொகுப்பு:

3

சம்ய கலாச்சாரம் - பாண்டிய தொகுப்பு - கலஹப சீன்பு

அலகு II  ஆண்டுவடிவமான கலப்பு தொகுப்பு:

3

சம்யகலாச்சாரம் முதலில் பாழ்வன சாத்தளம் & சம்யகலாச்சாரம் சொற்று

அலகு III  கவளொண்ளச் சொன்றுகள்:

3

கப்பல் கட்டும் களல் – இரும்புத் ததொல்லுசொன்றுகள் – பிரிட்டிஷ்

அலகு IV  கவளொண்ளச் சொன்றுகள்:

3

கவளொண்ளச் சொன்றுகள் - மணிகள் – சுடுமண்

அலகு V  அறிவியல் தமிழ் மற்றும் கைித்தமிழ்:

3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி -

விவரம் 54
TEXT-CUM-REFERENCE BOOKS

1. Tamil Life – Medieval and Modern History (Dr. S. V. Subatinan
   and Dr. K. D. Thirunavukkarasu).

2. Vedas to Sangam - Tamil Language Textbook.

3. Tamil – Classical Period (Dr. K. K. Pillay).

4. Social Life of Tamils (Dr. K. K. Pillay) – A joint publication of TNTB & ESC and RMRL.

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### NCC Credit Course Level 1

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#### SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

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**TOTAL: 30 PERIODS**
NX3252  
NCC Credit Course Level 1*  
(NAVAL WING)  
NCC Credit Course Level 1  

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TOTAL: 30 PERIODS
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(AIR FORCE WING)  
NCC Credit Course Level 1

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**TOTAL : 30 PERIODS**
COURSE 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 switch board 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 air conditioner.

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

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

- 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.
- Wire various electrical joints in common household electrical wire work.
- 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.
- Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.
COURSE OBJECTIVES:

- To gain hands-on experience in Thevenin & Norton theorem, KVL & KCL, and Superposition Theorems.
- To understand the working of RL, RC and RLC circuits

List of Experiments:
1. Verifications of KVL & KCL.
2. Verifications of Thevenin & Norton theorem.
3. Verification of Superposition Theorem.
4. Verification of maximum power transfer Theorem.
5. Determination of Resonance Frequency of Series & Parallel RLC Circuits.

Laboratory Requirements:
- Resistors, Capacitors, Inductors – sufficient quantities.
- Bread Boards – 15 Nos.
- CRO (30MHz) – 10 Nos.
- Function Generators (3MHz) – 10 Nos.
- Dual Regulated Power Supplies (0 – 30V) – 10 Nos.

COURSE OUTCOMES:
At the end of the course, the student will be able to
- Design RL and RC circuits.

TEXT BOOKS

REFERENCES
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.

COURSE OBJECTIVES :

- To introduce the basic notions of vector spaces which will then be used to solve related problems.
To understand the concepts of vector space, linear transformations, inner product spaces and orthogonalization.

To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.

To provide necessary basics in probability that are relevant in applications such as random signals, linear systems in communication engineering.

To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.

**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 RANDOM PROCESSES 9 + 3**

Classification – Stationary process – Markov process - Poisson process - Discrete parameter Markov chain – Chapman Kolmogorov equations (Statement only) - Limiting distributions.

**UNIT - IV VECTOR SPACES 9 + 3**

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

**UNIT - V  LINEAR TRANSFORMATION AND INNER PRODUCT SPACES 9 + 3**


**TOTAL: 60 PERIODS**

**COURSE OUTCOMES :**

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

**CO1:** Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.

**CO2:** Demonstrate accurate and efficient use of advanced algebraic techniques.

**CO3:** Apply the concept of random processes in engineering disciplines.

**CO4:** Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.

**CO5:** Understand the basic concepts of one and two dimensional random variables and apply them to model engineering problems.

**TEXTBOOKS :**


REFERENCES:

CS3353 C PROGRAMMING AND DATA STRUCTURES L T P C
3 0 0 3

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)

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

UNIT III LINEAR DATA STRUCTURES (8+1 SKILL)

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

UNIT V SORTING AND SEARCHING TECHNIQUES (8+1 SKILL)
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

EC3354 SIGNALS AND SYSTEMS 3 1 0 4

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

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 6+6
Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids _Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals -Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant& Time-invariant, Causal & Non-causal, Stable & Unstable.
UNIT II  ANALYSIS OF CONTINUOUS TIME SIGNALS  6+6
Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and Properties

UNIT III  LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS  6+6

UNIT IV  ANALYSIS OF DISCRETE TIME SIGNALS  6+6
Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT)– Properties of DTFT - Z Transform & Properties

UNIT V  LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS  6+6

TOTAL: 30+30 PERIODS

COURSE OUTCOMES:
At the end of the course, the student will be able to:
CO1:determine if a given system is linear/causal/stable
CO2: determine the frequency components present in a deterministic signal
CO3:characterize continuous LTI systems in the time domain and frequency domain
CO4:characterize discrete LTI systems in the time domain and frequency domain
CO5:compute the output of an LTI system in the time and frequency domains

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:

- To give a comprehensive exposure to all types of devices and circuits constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits.
- To analyze the frequency response of small signal amplifiers.
- To design and analyze single stage and multistage amplifier circuits.
- To study about feedback amplifiers and oscillators principles.
- To understand the analysis and design of multi vibrators.

UNIT I SEMICONDUCTOR DEVICES
PN junction diode, Zener diode, BJT, MOSFET, UJT—structure, operation and V-I characteristics, diffusion and transition capacitance—Rectifiers—Half Wave and Full Wave Rectifier, Zener as regulator.

UNIT II AMPLIFIERS
Load line, operating point, biasing methods for BJT and MOSFET, BJT small signal model—Analysis of CE, CB, CC amplifiers—Gain and frequency response—MOSFET small signal model—Analysis of CS, CG and Source follower—Gain and frequency response—High frequency analysis.

UNIT III MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER
Cascode amplifier, Differential amplifier—Common mode and Difference mode analysis—MOSFET input stages—tuned amplifiers—Gain and frequency response—Neutralization methods.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS
Advantages of negative feedback—Voltage/Current, Series, Shunt feedback Amplifiers—positive feedback—Condition for oscillations, phase shift—Wien bridge, Hartley, Colpitts and Crystal oscillators.

UNIT V POWER AMPLIFIERS AND DC/DC CONVERTERS
Power amplifiers—class A-Class B-Class AB-Class C-Power MOSFET—Temperature Effect—Class AB Power amplifier using MOSFET—DC/DC convertors—Buck, Boost, Buck-Boost analysis and design.

COURSE OUTCOMES:

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

CO1: Explain the structure and working operation of basic electronic devices.
CO2: Design and analyze amplifiers.
CO3: Analyze frequency response of BJT and MOSFET amplifiers.
CO4: Design and analyze feedback amplifiers and oscillator principles.
CO5: Design and analyze power amplifiers and supply circuits.

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EC3351 CONTROL SYSTEMS

COURSE OBJECTIVES:
- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the state variable analysis.

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION
Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems-Synchronous-Multivariable control system

UNIT II TIME RESPONSE ANALYSIS
Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system- type number-PID control-Analytical design for PD, PI,PID control systems

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS
Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system- Bode Plot - Polar Plot- Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

UNIT IV CONCEPTS OF STABILITY ANALYSIS
UNIT V  CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS
State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.

TOTAL:45 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course the student will be able to
CO1: Compute the transfer function of different physical systems.
CO2: Analyse the time domain specification and calculate the steady state error.
CO3: Illustrate the frequency response characteristics of open loop and closed loop system response.
CO4: Analyse the stability using Routh and root locus techniques.
CO5: Illustrate the state space model of a physical system and discuss the concepts of sampled data control system.

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EC3352  DIGITAL SYSTEMS DESIGN  L T P C
3 0 2 4

COURSE OBJECTIVES:
- To present the fundamentals of digital circuits and simplification methods
- To practice the design of various combinatorial digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits
- To learn integrated circuit families.
To introduce semiconductor memories and related technology

UNIT I  BASIC CONCEPTS  9
Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions-Karnaugh map, completely and incompletely specified functions, Implementation of Boolean expressions using universal gates ,Tabulation methods.

UNIT II  COMBINATIONAL LOGIC CIRCUITS  9
Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital trans-receiver / 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder

UNIT III  SYNCHRONOUS SEQUENTIAL CIRCUITS  9
Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment,lock - out condition circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock

UNIT IV  ASYNCHRONOUS SEQUENTIAL CIRCUITS  9
Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits, Design of Hazard free circuits.

UNIT V  LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES  9
Logic families- Propagation Delay, Fan - In and Fan - Out - Noise Margin - RTL ,TTL,ECL, CMOS - Comparison of Logic families - Implementation of combinational logic/sequential logic design using standard ICs, PROM, PLA and PAL, basic memory, static ROM,PROM,EPROM,EAPROM EAPROM.

PRACTICAL EXERCISES :  45 PERIODS
1. Design of adders and subtractors & code converters.
2. Design of Multiplexers & Demultiplexers.
3. Design of Encoders and Decoders.
4. Design of Magnitude Comparators
5. Design and implementation of counters using flip-flops
6. Design and implementation of shift registers.

COURSE OUTCOMES :  30 PERIODS
At the end of the course the students will be able to

CO1: Use Boolean algebra and simplification procedures relevant to digital logic.
CO2: Design various combinational digital circuits using logic gates.
CO3:Analyse and design synchronous sequential circuits.
CO4: Analyse and design asynchronous sequential circuits.
CO5: Build logic gates and use programmable devices

TOTAL:75 PERIODS
TEXTBOOKS:

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EC3361 ELECTRONIC DEVICES AND CIRCUITS LABORATORY L T P C 0 0 3 1.5

COURSE OBJECTIVES
- To learn the characteristics of PN Junction diode and Zener diode.
- To understand the operation of rectifiers and filters.
- To study the characteristics of amplifier.

LIST OF EXPERIMENTS
2. Full Wave Rectifier with Filters.
3. Design of Zener diode Regulator.
5. MOSFET Drain current and Transfer Characteristics.
6. Frequency response of CE and CS amplifiers.
7. Frequency response of CB and CC amplifiers.
8. Frequency response of Cascode Amplifier
9. CMRR measurement of Differential Amplifier

COURSE OUTCOMES
At the end of the laboratory course, the student will be able to understand the
CO1: Characteristics of PN Junction Diode and Zener diode.
CO2: Design and Testing of BJT and MOSFET amplifiers.
CO3: Operation of power amplifiers.

TOTAL: 45 PERIODS
LAB REQUIREMENTS
1. CRO/DSO (30 MHz) – 15 Nos.
2. Signal Generators / Function Generators (3 MHz) – 15 Nos.
3. Dual Regulated Power Supplies (0-30 v) - 15 Nos.
5. BC107, BC547, BF195C, BFW10, IN4001, IN4007 – 25 each
6. SPICE Simulator

REFERENCE:
XYZ of Oscilloscope – Application note: Tektronix USA.

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CS3362 C PROGRAMMING AND DATA STRUCTURES LABORATORY

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
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

**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

**TOTAL: 45 PERIODS**

**GE3361**

**PROFESSIONAL DEVELOPMENT**

**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:** 10 Hours

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 footnote

Viewing document in different modes
Working with document protection and security
Inspect document for accessibility

**MS EXCEL:**

10 Hours
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

**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.
COURSE OBJECTIVES:

- To impart knowledge on the basics of static electric field and the associated laws
- To impart knowledge on the basics of static magnetic field and the associated laws
- To give insight into coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To gain the behaviour of the propagation of EM waves
- To study the significance of Time varying fields.

UNIT I INTRODUCTION
Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem, Verify theorems for different path, surface and volume.

UNIT II ELECTROSTATICS
Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Electrostatics boundary value problems, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law.

UNIT III MAGNETOSTATICS
Lorentz force equation, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Calculation of magnetic field intensity for various current distributions Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques.

UNIT IV TIME-VARYING FIELDS AND MAXWELL's EQUATIONS

UNIT V PLANE ELECTROMAGNETIC WAVES
Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary.

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

- CO1: Relate the fundamentals of vector, coordinate system to electromagnetic concepts
- CO2: Analyze the characteristics of Electrostatic field
- CO3: Interpret the concepts of Electric field in material space and solve the boundary conditions
- CO4: Explain the concepts and characteristics of Magneto Static field in material space and solve boundary conditions.
- CO5: Determine the significance of time varying fields

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES

EC3401 NETWORKS AND SECURITY

OBJECTIVES:
- To learn the Network Models and datalink layer functions.
- To understand routing in the Network Layer.
- To explore methods of communication and congestion control by the Transport Layer.
- To study the Network Security Mechanisms.
- To learn various hardware security attacks and their countermeasures.

UNIT I NETWORK MODELS AND DATALINK LAYER

UNIT II NETWORK LAYER PROTOCOLS

UNIT III TRANSPORT AND APPLICATION LAYERS

UNIT IV NETWORK SECURITY

UNIT V HARDWARE SECURITY

PRACTICAL EXERCISES:
Experiments using C
1. Implement the Data Link Layer framing methods,
1. Bit stuffing, (ii) Character stuffing
2. Implementation of Error Detection / Correction Techniques
   i) LRC, (ii) CRC, (iii) Hamming code
3. Implementation of Stop and Wait, and Sliding Window Protocols
5. Implementation of Distance Vector Routing algorithm (Routing Information Protocol) (Bellman-Ford).
6. Implementation of Link State Routing algorithm (Open Shortest Path First) with 5 nodes (Dijkstra's).
7. Data encryption and decryption using Data Encryption Standard algorithm.
8. Data encryption and decryption using RSA (Rivest, Shamir and Adleman) algorithm.

Experiments using Tool Command Language
1. Implement and realize the Network Topology - Star, Bus and Ring using NS2.
2. Implement and perform the operation of CSMA/CD and CSMA/CA using NS2.

OUTCOMES:
Upon successful completion of the course the student will be able to
CO1: Explain the Network Models, layers and functions.
CO2: Categorize and classify the routing protocols.
CO3: List the functions of the transport and application layer.
CO4: Evaluate and choose the network security mechanisms.
CO5: Discuss the hardware security attacks and countermeasures.

TOTAL:75 PERIODS

TEXTBOOKS

REFERENCES

EC3451 LINEAR INTEGRATED CIRCUITS

COURSE OBJECTIVES:
● To introduce the basic building blocks of linear integrated circuits
● To learn the linear and non-linear applications of operational amplifiers
● To introduce the theory and applications of analog multipliers and PLL
● To learn the theory of ADC and DAC
● To introduce the concepts of waveform generation and introduce some special function ICs
UNIT I  BASICS OF OPERATIONAL AMPLIFIERS  
Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – MOSFET Operational Amplifiers – LF155 and TL082.

UNIT II  APPLICATIONS OF OPERATIONAL AMPLIFIERS  
Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III  ANALOG MULTIPLIER AND PLL  
Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization

UNIT IV  ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS  

UNIT V  WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs  
Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC

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

CO1 : Design linear and nonlinear applications of OP – AMPS
CO2 : Design applications using analog multiplier and PLL
CO3 : Design ADC and DAC using OP – AMPS
CO4 : Generate waveforms using OP – AMP Circuits
CO5 : Analyze special function ICs

TOTAL:45 PERIODS

TEXT BOOK
REFERENCES

COURSE OBJECTIVES:
- To learn discrete fourier transform, properties of DFT and its application to linear filtering
- To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
- To understand the effects of finite precision representation on digital filters
- To understand the fundamental concepts of multi rate signal processing and its applications
- To introduce the concepts of adaptive filters and its application to communication engineering

UNIT I DISCRETE FOURIER TRANSFORM 9

UNIT II INFINITE IMPULSE RESPONSE FILTERS 9

UNIT III FINITE IMPULSE RESPONSE FILTERS 9
Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations.
UNIT IV  
FINITE WORD LENGTH EFFECTS  
9
Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.

UNIT V  
DSP APPLICATIONS  
9
Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor - Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP Architecture-Fixed and Floating point architecture principles

PRACTICAL EXERCISES:

MATLAB / EQUIVALENT SOFTWARE PACKAGE/ DSP PROCESSOR BASED IMPLEMENTATION
1. Generation of elementary Discrete-Time sequences
2. Linear and Circular convolutions
3. Auto correlation and Cross Correlation
4. Frequency Analysis using DFT
5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation
6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations
7. Study of architecture of Digital Signal Processor
8. Perform MAC operation using various addressing modes
9. Generation of various signals and random noise
10. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
11. Design and demonstration of Butterworth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering
12. Implement an Up-sampling and Down-sampling operation in DSP Processor

COURSE OUTCOMES:
At the end of the course students will be able to:
CO1: Apply DFT for the analysis of digital signals and systems
CO2: Design IIR and FIR filters
CO3: Characterize the effects of finite precision representation on digital filters
CO4: Design multirate filters
CO5: Apply adaptive filters appropriately in communication systems

TOTAL: 75 PERIODS

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EC3491 COMMUNICATION SYSTEMS

COURSE OBJECTIVES:
- To introduce Analog Modulation Schemes
- To impart knowledge in random process
- To study various Digital techniques
- To introduce the importance of sampling & quantization
- To impart knowledge in demodulation techniques
- To enhance the class room teaching using smart connectivity instruments

UNIT I AMPLITUDE MODULATION

UNIT II RANDOM PROCESS & SAMPLING
Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.
Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Nyquist criterion- Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM

UNIT III DIGITAL TECHNIQUES
Pulse modulation Differential pulse code modulation. Delta modulation, Noise considerations in PCM., Digital Multiplexers, Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder
UNIT IV  DIGITAL MODULATION SCHEME 9
Geometric Representation of signals - Generation, detection, IQ representation, PSD & BER of Coherent BPSK, BFSK, & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Synchronization and Carrier Recovery for Digital modulation, Spectrum Analysis – Occupied bandwidth – Adjacent channel power, EVM, Principle of DPSK

UNIT V  DEMODULATION TECHNIQUES 9

COURSE OUTCOMES:
At the end of the course students will be able to
CO1: Gain knowledge in amplitude modulation techniques
CO2: Understand the concepts of Random Process to the design of communication systems
CO3: Gain knowledge in digital techniques
CO4: Gain knowledge in sampling and quantization
CO5: Understand the importance of demodulation techniques

TEXTBOOKS:

REFERENCES:
5. H P Hsu, Schaum Outline Series - "Analog and Digital Communications" TMH 2006

GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY L T P C 2 0 0 2

UNIT I  ENVIRONMENT AND BIODIVERSITY 6

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

UNIT IV  SUSTAINABILITY AND MANAGEMENT  6
Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects
of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-
Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global,
Regional and local environmental issues and possible solutions-case studies. Concept of Carbon
Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V  SUSTAINABILITY PRACTICES  6
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment,
Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy
efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles-
carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-
economical and technological change.

TOTAL:30 PERIODS

TEXT BOOKS :
2016.
Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and
development, Cengage learning.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication,

REFERENCES :
1. R.K. Trivedi, ‘Handbook of Environmental Laws, Rules, Guidelines, Compliances and
3. Dharmendra S. Sengar, ‘Environmental law’, Prentice hall of India PVT. LTD, New Delhi,
2007.
4. Rajagopalan, R, ‘Environmental Studies-From Crisis to Cure’, Oxford University Press, Third
5. Erach Bharucha “Textbook of Environmental Studies for Undergraduate Courses” Orient
EC3461 COMMUNICATION SYSTEMS LABORATORY

COURSE OBJECTIVES:
- To study the AM & FM Modulation and Demodulation.
- To learn and realize the effects of sampling and TDM.
- To understand the PCM & Digital Modulation.
- To Simulate Digital Modulation Schemes.
- To Implement Equalization Algorithms and Error Control Coding Schemes.

LIST OF EXPERIMENTS
1. AM- Modulator and Demodulator
2. FM - Modulator and Demodulator
4. Signal sampling and TDM.
5. Pulse Code Modulation and Demodulation.
6. Pulse Amplitude Modulation and Demodulation.
7. Pulse Position Modulation and Demodulation and Pulse Width Modulation and Demodulation.
8. Digital Modulation – ASK, PSK, FSK.
10. Simulation of ASK, FSK, and BPSK Generation and Detection Schemes.
12. Simulation of Linear Block and Cyclic Error Control coding Schemes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the laboratory course, the student will be able to understand the:
1. Design AM, FM & Digital Modulators for specific applications.
2. Compute the sampling frequency for digital modulation.
3. Simulate & validate the various functional modules of Communication system.
4. Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes.
5. Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of Communication system.

LAB REQUIREMENTS:
2. Trainer Kits for ASK, FSK and PSK.
3. CRO/DSO (30 MHz) – 15 Nos.
4. Signal Generators / Function Generators (3 MHz) – 15 Nos.
5. MATLAB or equivalent opensource software package for simulation Experiments.
6. PCs - 15 Nos.

EC3462 LINEAR INTEGRATED CIRCUITS LABORATORY

COURSE OBJECTIVES:
- To gain hands on experience in designing electronic circuits
- To learn simulation software used in circuit design
● To learn the fundamental principles of amplifier circuits
● To differentiate feedback amplifiers and oscillators.
● To differentiate the operation of various multivibrators

LIST OF EXPERIMENTS:

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers - Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. RC Integrator and Differentiator circuits using Op-Amp
5. Clippers and Clamps
6. Instrumentation amplifier
7. Active low-pass, High pass & Band pass filters
8. PLL Characteristics and its use as frequency multiplier, clock synchronization
9. R-2R ladder type D-A converter using Op-Amp

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin-T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

LAB REQUIREMENT FOR A BATCH OF 30 STUDENTS:

S.NO EQUIPMENTS
1. 70MHz DSO with built in 4 bit pattern generator and 50 MHz AFG -15 Nos
2. Programmable Triple o/p Power Supplies (0 – 30V/3A)(0-30V/3A)(0-5V/3A) -15 Nos
3. Digital Multimeter -15 Nos
4. Digital LCR Meter -2 Nos
5. Standalone desktops PC -15 Nos
6. Transistor/MOSFET (BJT-NPN-PNP and NMOS/PMOS) -50 Nos
7. IC Tester -5 Nos

Components and Accessories:
Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers.
SPICE Circuit Simulation Software: (any public domain or commercial software)

Note: Op-Amps uA741, LM 301, LM311, LM 324, LM317, LM723, 7805, 7812, 2N3524, 2N3525, 2N3391, AD 633, LM 555, LM 565 may be used

TOTAL: 45 PERIODS

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

● Analyze various types of feedback amplifiers
● Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators
● Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators, filters using SPICE Tool.
● Design amplifiers, oscillators, D-A converters using operational amplifiers.
● Design filters using op-amp and perform an experiment on frequency response