VISION OF THE INSTITUTE

The vision of Anna University is to be a world-class institution by producing professionals with high technical knowledge, professional skills and ethical values, and remain a preferred partner to the industry and community for their economic and social development through excellence in teaching, research and consultancy. Anna University shall be recognized as a point of reference, a catalyst, a facilitator, a trend setter and a leader in technical education.

MISSION OF THE INSTITUTE

Anna University shall contribute to the educational, economic and social development by

- Producing students who are intellectually and technically equipped with well defined knowledge, skills and ethics, who are creative thinkers, inspiring leaders and contributing citizens
- Introducing high quality academic and research programmes and providing extension services in cutting edge technologies
- Ensuring a supportive campus climate with dynamic leadership and development opportunities to meet the needs of the students, faculty and staff
- Enhancing academic productivity through induction of quality faculty, accelerated graduation, credit banking, augmented continuing education opportunities and adoption of current technology
- Sharing the intellectual resources and the infrastructural facilities among the academia from other institutions and among the industrial society, funding agencies and government
- Enhancing the collaborative partnership between Industry and Institute for commercializing and transferring the latest technological know-how towards societal development
- Setting up a Global University Network Campus that embodies the ideals of an open, democratic and global society catering to the needs of the global community and satisfying cultural, ethnic and racial diversity
- Expanding global participation spread across continents with the aid of interactive satellite based education and the usage of digital library
- Enriching the national and international character of the University
- Ensuring efficient administrative coordination and effective decision making through necessary reforms and by strategically allocating resources
- Benchmarking against technologically sound global leaders with a view towards continuous improvement.
VISION OF THE DEPARTMENT

The vision of the department is to produce analytically proficient and technologically competent Electrical and Electronics Engineers who can serve and take forward the academic, industry and research organizations to newer heights and be effective for building the nation.

MISSION OF THE DEPARTMENT

M1: To impart high quality technical education with the state of the art laboratory practice.
M2: To provide conducive academic ambience to enable best teaching and learning processes.
M3: To generate resources through research and consultancy projects for pursuing research and developmental activities in emerging areas.
M4: To associate with academic and industrial organizations for research activities to develop and provide vital and viable solutions for social needs indigenously.
M5: To develop leadership skills in students with high degree of ethics, morals and values and instill confidence to lead the organization.
1. **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

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

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

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

<table>
<thead>
<tr>
<th>PO#</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
</tr>
<tr>
<td>2</td>
<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
</tr>
<tr>
<td>3</td>
<td>Design/development of solutions</td>
<td>Design an electrical system or process to improve its performance, satisfying its constraints.</td>
</tr>
<tr>
<td>4</td>
<td>Conduct investigations of complex problems</td>
<td>Conduct experiments in electrical and electronics systems and interpret the data.</td>
</tr>
<tr>
<td>5</td>
<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
</tr>
<tr>
<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
</tr>
<tr>
<td>7</td>
<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
</tr>
<tr>
<td>8</td>
<td>Ethics</td>
<td>Interacting industry, business and society in a professional and ethical manner.</td>
</tr>
<tr>
<td>9</td>
<td>Individual and team work</td>
<td>Function in a multidisciplinary team.</td>
</tr>
<tr>
<td>10</td>
<td>Communication</td>
<td>Proficiency in oral and written Communication.</td>
</tr>
<tr>
<td>11</td>
<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
</tr>
<tr>
<td>12</td>
<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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</table>
4. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Electrical and Electronics Engineering program the student will have following Program specific outcomes.

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

2. Foundations of power system development: Ability to understand the structure and development methodologies of electrical systems using knowledge on circuits, electronics for automation and control. Possess professional skills and knowledge of electrical system modeling and design of small and large systems. Familiarity and practical competence with a broad range of practice through experimentation on electrical circuits, electronic circuits and programming platforms.

3. Foundation of mathematical concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate engineering tools and suitable algorithm.

4. Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and hence to provide solution leading to new ideas and innovations.

4. PEO / PO Mapping:

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<thead>
<tr>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
<th>PROGRAMME OUTCOMES</th>
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### MAPPING – UG- ELECTRICAL AND ELECTRONICS ENGINEERING

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The table above represents the course offerings for the specified years and semesters.
### ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING
CURRICULA AND SYLLABI FOR I TO VIII SEMESTERS
(Applicable to Students admitted from the Academic Year 2022-2023 onwards)

#### SEMESTER I

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<th>S. No.</th>
<th>Course Code</th>
<th>Course Title</th>
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| PRACTICALS |             |                                                  |          |      |             |                        |         |
| 7.         | BS5161      | Basic Sciences Laboratory                        | BSC      | 0    0  4        | 4                      | 2       |
| 8.         | GE5161      | Problem Solving and Python Programming Laboratory | ESC      | 0    0  4        | 4                      | 2       |
|            | GE5163      | English Laboratory $^s$                           | EEC      | 0    0  2        | 2                      | 1       |

**TOTAL** 16 1 10 27 22

$^s$ Skill Based Course

#### SEMESTER II

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| 7.         | GE5162      | Workshop Practices Laboratory                    | ESC      | 0    0  4        | 4                      | 2       |
| 8.         | EE5211      | Basic Electrical and Electronics Engineering Laboratory | ESC      | 0    0  4        | 4                      | 2       |
| 9.         | GE5262      | Communication Laboratory / Foreign Language $^g$   | EEC      | 0    0  4        | 4                      | 2       |

**TOTAL** 14 2 12 28 22

$^g$ value added course
## SEMESTER III

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$^*$ Skill Based Course

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$^*$ Audit Course is optional
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**TOTAL** 18 0 8 26 19

* Audit Course is optional

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### ENGINEERING SCIENCE COURSE (ESC)

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### AUDIT COURSES (AC)

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# value added course

$^3$ Skill Based Course

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**SUMMARY**

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Non-Credit/(Audit Course) | 0 0 | 0

**TOTAL** | 171 |
OBJECTIVES

- To build lexical competency and accuracy that will help learners to use language effectively.
- To learn various reading strategies that will enable learners to comprehend the different modes of reading materials of varied levels of complexity.
- To comprehend the linguistic aspects of various rhetorical structures and functions of Technical English and use them effectively in writing.

UNIT I  INTRODUCING ONESELF  9
Theory:
Reading: Descriptive passages (From Newspapers / Magazines) – Writing: Writing a coherent paragraph (Native Place, School Life) – Grammar: Simple present tense, Present continuous tense – Vocabulary development: One word substitution.

UNIT II  DIALOGUE WRITING  9
Theory:
Reading: Reading a print interview (Comprehension and inference questions) - Writing: Writing a checklist - Dialogue writing – Grammar: Simple past tense – Question formation (Wh-Questions, ‘Yes’ or ‘No’ Questions, Tag Questions) – Vocabulary Development: Lexical items relevant to the theme of the given unit.

UNIT III  FORMAL LETTER WRITING  9
Theory:

UNIT IV  WRITING LETTERS OF COMPLAINT  9
Theory:

UNIT V  WRITING DEFINITIONS AND PRODUCT DESCRIPTION  9
Theory:

TOTAL : 45 PERIODS

LEARNING OUTCOMES:
On completion of the course, the students will be able to:
- Use appropriate language structures and lexical items in authentic contexts.
- Read both general and technical texts and comprehend their denotative and connotative meanings.
- Write different kinds of formal documents with grammatical and lexical appropriacy.
Assessment Pattern
- Two written internal assessments to test learner's progress in grammar, vocabulary, reading and writing skills.
- End Semester exam to be tested in two parts: Theory exam for three hours and listening and speaking skills for two hours.
OBJECTIVES:

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

UNIT I MATRICES

Eigenvalues and Eigenvectors of a real matrix - Characteristic equation - Properties of eigenvalues and eigenvectors - Cayley-Hamilton theorem - Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation - Nature of quadratic forms.

UNIT II DIFFERENTIAL CALCULUS


UNIT III FUNCTIONS OF SEVERAL VARIABLES


UNIT IV INTEGRAL CALCULUS

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

UNIT V MULTIPLE INTEGRALS

Double integrals - Change of order of integration - Double integrals in polar coordinates - Area enclosed by plane curves - Triple integrals - Volume of solids - Change of variables in double and triple integrals.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: Use the matrix algebra methods for solving practical problems.
CO2: Apply differential calculus tools in solving various application problems.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply different methods of integration in solving practical problems.
CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.
**TEXTBOOKS:**

**REFERENCES:**
PH5151 ENGINEERING PHYSICS
(Common to all branches of B.E / B.Tech programmes)

OBJECTIVE
- To make the students understand the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.
- To enable the students in understanding the importance of quantum physics.
- To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

UNIT I MECHANICS

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

UNIT III OSCILLATIONS, OPTICS AND LASERS

UNIT IV BASIC QUANTUM MECHANICS
Photons and light waves - Electrons and matter waves - The Schrödinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS
The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch’s theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Understanding the importance of mechanics.
CO2: Express the knowledge of electromagnetic waves.
CO3: Know the basics of oscillations, optics and lasers.
CO4: Understanding the importance of quantum physics.
CO5: Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS

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CY5151   ENGINEERING CHEMISTRY   L T P C
(COMMON TO ALL BRANCHES)   3 0 0 3

OBJECTIVES:
- To introduce the basic concepts of polymers, their properties and some of the important applications.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of the laws of photochemistry, photo processes and instrumentation & applications of spectroscopic techniques.
- To familiarize the operating principles and applications of energy conversion, its processes and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

UNIT I   POLYMER CHEMISTRY
UNIT II  NANO CHEMISTRY

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV  ENERGY CONVERSIONS AND STORAGE
Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant – fast breeder reactor. Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). Fuel cells – H₂-O₂ and microbial fuel cell. Explosives – classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V  WATER TECHNOLOGY
Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD and BOD. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning - phosphate, calgon and carbonate treatment. External conditioning - zeolite (permunt) and ion exchange demineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
CO2: To identify and apply basic concepts of nano science and nanotechnology in designing the synthesis of nano materials for engineering and technology applications.
CO3: To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.
CO4: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.
CO5: To demonstrate the knowledge of water and their quality in using at different industries.

TEXT BOOKS:
Company (P) Ltd, New Delhi, 2015.


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GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C

OBJECTIVES:

- To know the basics of algorithmic problem solving.
- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING 9

Suggested Activities:

- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic operations.
- Installing Python.
- Simple programs on print statements, arithmetic operations.

Suggested Evaluation Methods:

- Assignments on pseudocodes and flowcharts.
- Tutorials on Python programs.
UNIT II CONDITIONALS AND FUNCTIONS
Operators - Boolean Values - Operator Precedence - Expression - Conditionals: If-Else Constructs - Loop Structures/Iterative Statements - While Loop - For Loop - Break Statement - Function Call and Returning Values - Parameter Passing - Local and Global Scope - Recursive Functions.

Suggested Activities:
- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.
- Implementation of a simple calculator.
- Developing simple applications like calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.
- External learning - Recursion vs. Iteration.

Suggested Evaluation Methods:
- Tutorials on the above activities.
- Group Discussion on external learning.

UNIT III SIMPLE DATA STRUCTURES IN PYTHON

Suggested Activities:
- Implementing Python program using lists, tuples, sets for the following scenario: Simple sorting techniques Student Examination Report Billing Scheme during shopping.
- External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

Suggested Evaluation Methods:
- Tutorials on the above activities.
- Group Discussion on external learning component.

UNIT IV STRINGS, DICTIONARIES, MODULES

Suggested Activities:
- Implementing Python program by importing Time module, Math package etc.
- Creation of any package (student’s choice) and importing into the application.

Suggested Evaluation Methods:
- Tutorials on the above activities.
UNIT V FILE HANDLING AND EXCEPTION HANDLING

Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position - Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

Suggested Activities:
- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks - for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.

Suggested Evaluation Methods:
- Tutorials on the above activities.
- Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs 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 BOOK:

REFERENCES:
UNIT I  LANGUAGE AND LITERATURE 3

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

UNIT III FOLK AND MARTIAL ARTS 3
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. சகீர்திக் வாழ்க்கை - பொதுவானம் பன்னாட்டில் – வில்லை, பெருமான் (புதிய புதியங்கொடி: சகீர்திக் பாடல் பொருட்கள் புதிய புதியங்கொடி)
2. கல்விக்குரு குடும்பான் - பொதுவான வீடு, தொழில் நலை (பதிப்பு பதிப்பு).
3. சிறீக்கை - மார்பு திருச்சுற்றுக்கொடி, தமிழ் மார்பு திருச்சுற்றுக்கொடி (தமிழ்ச்சுற்றுக்கொடி மார்பு சுற்றுக்கொடி)
4. பொருள் - பொருளை பதிவுசெய்யும் தமிழ் பதிவு (பதிவுசெய்யும் தமிழ் பதிவு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
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TOTAL : 15 PERIODS
BS5161 BASIC SCIENCES LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

L T P C 0 0 4 2

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

LIST OF EXPERIMENTS:
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of Young’s modulus
3. Uniform bending - Determination of Young’s modulus
4. Lee’s disc - Determination of thermal conductivity of a bad conductor
5. Potentiometer - Determination of thermo e.m.f. of a thermocouple
6. Laser - Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc - Determination of width of the groove using laser.
10. Ultrasonic interferometer - determination of the velocity of sound and compressibility of liquids
11. Post office box - Determination of Band gap of a semiconductor.
13. Photoelectric effect
14. Michelson Interferometer.
16. Melde’s string experiment

TOTAL: 30 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: To determine various moduli of elasticity.
CO2: To determine the velocity of ultrasonic waves, band gap determination
CO3: To determine various thermal and optical properties of materials.
CO4: To determine the viscosity of liquids
CO5: To determine the estimation of laser parameters

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CHEMISTRY LABORATORY: (Minimum of 8 experiments to be conducted)

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

LIST OF EXPERIMENTS:

1. Estimation of HCl using Na$_2$CO$_3$ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Phase change in a solid.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
CO2: To determine the amount of metal ions through volumetric and spectroscopic techniques
CO3: To determine the molecular weight of polymers by viscometric method.
CO4: To quantitatively analyse the impurities in solution by electroanalytical techniques
CO5: To design and analyse the kinetics of reactions and corrosion of metals

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

EXPERIMENTS:
1. Identification and solving of simple real life or scientific or technical problems, and developing
   flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python data structures.
CO6: Apply Python features in developing software applications.

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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 acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in engineering problems.
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I VECTOR CALCULUS
12
Gradient and directional derivative - Divergence and Curl - Irrotational and Solenoidal vector fields - Line integral over a plane curve - Surface integral - Area of a curved surface - Volume integral - Green’s theorem, Stoke’s theorem and Gauss divergence theorem - Verification and application in evaluating line, surface and volume integrals.

UNIT II ANALYTIC FUNCTION
12
Analytic functions - Necessary and sufficient conditions for analyticity - Properties - Harmonic conjugates - Construction of analytic function - Conformal mapping - Mapping by functions - Bilinear transformation \( w = c + z, \ ax, \ 1/z, \ z^2 \).

UNIT III COMPLEX INTEGRATION
12
Line integral - Cauchy’s integral theorem - Cauchy’s integral formula - Taylor’s and Laurent’s series - Singularities - Residues - Residue theorem - Application of residue theorem for evaluation of real integrals - Use of circular contour and semicircular contour with no pole on real axis.

UNIT IV DIFFERENTIAL EQUATIONS
12

UNIT V LAPLACE TRANSFORMS
12
Existence conditions - Transforms of elementary functions - Transform of unit step function and unit impulse function - Basic properties - Shifting theorems - Transforms of derivatives and integrals - Initial and Final Value Theorems - Inverse Transforms - Convolution Theorem - Transform of periodic functions - Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
CO2: Construct analytic functions and use their conformal mapping property in application problems.
CO3: Evaluate real and complex integrals using the Cauchy’s integral formula and residue theorem.
CO4: Apply various methods of solving differential equation which arise in many application problems.
CO5: Apply Laplace transform methods for solving linear differential equations.

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TEXTBOOKS:

REFERENCES:
COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:
1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)
Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING
Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by different methods – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles - Representation of Three-Dimensional objects - Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES
Orthographic projection- principles-Principle 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 trapezoidal 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
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES
Sectioning of 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. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS
Principles of isometric projection – isometric scale -Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)
Introduction to drafting packages and demonstration of their use

TOTAL (L: 15 + P: 60) =75 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Draw free hand sketching of basic geometrical shapes and multiple views of objects.
CO2: Draw orthographic projections of lines and planes
CO3: Draw orthographic projections of solids
CO4: Draw development of the surfaces of objects.
CO5: Draw isometric and perspective views of simple solids.
TEXT BOOKS:

REFERENCES:

Publication of Bureau of Indian Standards:
1. IS 10711 – 2001: Technical products Documentation - Size and lay out of drawing sheets
2. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.
5. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Methods.

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.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

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EE5251 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LT P C 3 0 0 3

OBJECTIVES:
- To understand the basic concepts of electric circuits.
- To study about the three phase system and magnetic circuits
- To understand the operation of AC and DC machines.
- To understand the working principle of electronic devices
- To study the working of current controlled and voltage controlled devices.

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING
UNIT II  THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS  9


UNIT III  ELECTRICAL MACHINES  9


UNIT IV  BASICS OF ELECTRONICS  9

Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-Rectifier circuits-Wave shaping.

UNIT V  CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES  9

Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: To be able to understand the concepts related with electrical circuits and wiring.
CO2: To be able to study the different three phase connections and the concepts of magnetic circuits.
CO3: Capable of understanding the operating principle of AC and DC machines.
CO4: To be able to understand the working principle of electronic devices such as diode and zener diode.
CO 5: To be able to understand the characteristics and working of current controlled and voltage controlled devices.

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TEXT BOOKS:

REFERENCES:

GE5152 ENGINEERING MECHANICS LT P C
3 1 0 4

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and non coplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I STATICS OF PARTICLES (9+3)

UNIT II EQUILIBRIUM OF RIGID BODIES (9+3)

UNIT III DISTRIBUTED FORCES (9+3)
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION (9+3)
The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction. Rolling
Resistance, Ladder friction.

**UNIT V  DYNAMICS OF PARTICLES**


**TOTAL (L: 45 + T: 15) =60 PERIODS**

**COURSE OUTCOMES:**

After completion the above subject, students will be able to understand

CO1: Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.

CO2: Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.

CO3: Apply the concepts of locating centroids / center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.

CO4: Apply the concepts of frictional forces at the contact surfaces of various engineering systems.

CO5: Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

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**TEXT BOOKS:**


**REFERENCES:**


PH5252  PHYSICS FOR ELECTRONIC SCIENCES
(Common to EEE and EI Branches)

OBJECTIVE

• To make the students to understand the basics of crystallography and its importance in completion materials properties.
• To understand the electrical properties of materials including free electron theory, applications of quantum mechanics and magnetic materials.
• To instill 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
Crystal structures - Bravais lattices – packing factor of SC, BCC, FCC, HCP and diamond structures - Close-packed crystal directions and planes – Surface crystallography – surface structure for BCC and close packed structures - surface to volume ratio: plane, cylinder, cube, sphere - Number of atoms and number of surface atoms in a structure: unit cell approach - imperfections and impurities.

UNIT II  ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

UNIT III  SEMICONDUCTORS AND TRANSPORT PHYSICS
Intrinsic Semiconductors - Energy band diagram – direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors - extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - Carrier transport in Semiconductors: Drift, mobility and diffusion - Hall effect and devices - Ohmic contacts - Schottky diode.

UNIT IV  OPTICAL PROPERTIES OF MATERIALS
Classification of optical materials - Absorption emission and scattering of light in metals, insulators & Semiconductors - LED’s - Organic LED’s - Plasma light emitting devices - LCD’s - Laser diodes - Optical data storage techniques (including DVD, Blue -ray disc, Holographic data storage).

UNIT V  NANO DEVICES

TOTAL: 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Know basics of crystallography and its importance for materials properties
CO2: Come to have firm knowledge on the electrical and magnetic properties of materials and their applications
CO3: Acquire adequate understanding of semiconductor physics and functioning of semiconductor devices
CO4: Understand the optical properties of materials and working principles of various optical devices
CO5: Appreciate the importance of nanotechnology, physics of nano devices, low-dimensional structures and their applications

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GE5252 TAMILS AND TECHNOLOGY  L T P C  1 0 0 1

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. 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. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. 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)
6. 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)


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3. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
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10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

GE5162 WORKSHOP PRACTICES LABORATORY
(Common to all Branches of B.E. / B.Tech. Programmes)

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

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) Planning and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Completion joints in door panels and wooden furniture
b) Completion common industrial trusses using models.

PART II  ELECTRICAL ENGINEERING PRACTICES  15

WIRING WORK:

a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
b) Wiring Stair case light.
c) Wiring tube - light.
d) Preparing wiring diagrams for a given situation.

Wiring Study:

a) Completion an Iron-Box wiring.
b) Completion a Fan Regulator wiring.
c) Completion an Emergency Lamp wiring.

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) Completion a FM radio.
b) Completion an electronic telephone.

TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: 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.

CO2: Wire various electrical joints in common household electrical wire work.

CO3: 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 equipment; Make a tray out of metal sheet using sheet metal work.

CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.
OBJECTIVE:

• To provide practical knowledge of fundamental concepts of electrical and electronics engineering through relevant experiments.
• To impart hands on experience in measurement of electric and magnetic circuit parameters.
• To train the students in performing various tests on electrical motors, generators
• To Analyze various digital circuits.
• To study the characteristics of electronic devices.

LIST OF EXPERIMENTS

1. Choice of wire gauges, resistor colour coding and fuses for a given circuit
2. Measurement of DC and AC voltage and current in electrical circuits
4. Measurement of power factor, RMS, peak and frequency and measurement of inductance and capacitance
5. Star and delta connections with balanced and unbalanced loads.
7. V-I characteristics of DC / AC generator
8. V-I characteristics BJT / UJT / diode and development of one application circuit
9. Development of simple application circuits with digital devices
10. Application of MOSFET circuits.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand
CO1: Manipulate simple electric and magnetic circuits.
CO2: Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
CO3: Become familiar with the characteristics of various electronic devices.
CO4: Ability to Design and construct different digital application circuits.
CO5: Ability to assess the performance of various motors and generators.
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.
OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering;
- To develop the analytic solutions for partial differential equations used in engineering by Fourier series;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z-transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12
Formation - Solutions of first order equations - Standard types and Equations reducible to standard types - Lagrange’s Linear equation - Solution of linear equations of higher order with constant coefficients - Linear non-homogeneous partial differential equations.

UNIT II FOURIER SERIES 12
Dirichlet’s conditions - General Fourier series - Odd and even functions - Half-range Sine and cosine series - Complex form of Fourier series - Parseval’s identity - Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 12

UNIT IV FOURIER TRANSFORM 12
Fourier integral theorem - Fourier transform pair - Sine and cosine transforms - Properties - Transform of elementary functions - Convolution theorem - Parseval’s identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 12
Z-transform - Elementary properties - Inverse Z-transform - Convolution theorem - Initial and final value theorems - Formation of difference equation - Solution of difference equation using Z - transform.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Solve partial differential equations which arise in application problems.
CO2: Analyze the functions as an infinite series involving sine and cosine functions.
CO3: Obtain the solutions of the partial differential equations using Fourier series.
CO4: Obtain Fourier transforms for the functions which are needed for solving application problems.
CO5: Manipulate discrete data sequences using Z transform techniques.

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EE5301 SIGNALS AND SYSTEMS LT P C 3 0 0 3

Objectives

- To introduce the fundamentals and classifications of signals and systems
- To get familiarized to system representation and stability study with Laplace transform
- To analyze the continuous time signals, Fourier series and to learn to apply frequency analysis
- To impart knowledge on discrete time signals and discretised systems
- To understand importance of sampling sampling theorem and its implications

UNIT I INTRODUCTION TO SIGNALS AND SYSTEMS: 9
Continuous time signals - Discrete time signals - Representation of signals - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential signals, Operations on the signals - Classification of continuous and discrete time signals - Continuous time and discrete time systems - Classification of systems - Properties of systems

UNIT II BEHAVIOR OF CONTINUOUS AND DISCRETE-TIME LTI SYSTEMS 9

UNIT III FOURIER TRANSFORMS 9
Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain,
magnitude and phase response- The Discrete- Time Fourier Transform (DTFT) -properties- the
Discrete Fourier Transform (DFT) -properties- Linear and Circular Convolution

UNIT IV Z- TRANSFORMS
The z-Transform for discrete time signals and systems, system functions- Laplace Transforms to z-
transformation-, poles and zeros of systems and sequences, z-domain analysis- Properties – Z
Transformation: Properties – Different methods of finding Inverse Z-Transformation

UNIT V SAMPLING AND RECONSTRUCTION
The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal
interpolator, zero-order hold, first-order hold. Aliasing and its effects- applications -filtering, feedback
control systems

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Apply the concepts of continuous time and discrete time systems to analyse systems intime
domain
CO2: Understand system stability analysis
CO3: Apply the concepts of continuous time and discrete time systems to analyse systems in frequency
domain.
CO4: Understand implications of z-Transform in digitizing in system analysis
CO5: Understand sampling theorem and its implications in during signal reconstruction.

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TEXT BOOKS
   India, 1997.

REFERENCES
   Education, 2004
   Learning, 2005.
OBJECTIVES:
- To review the fundamentals of the different coordinate systems, vector algebra and calculus
- To teach the basic laws of electromagnetism
- To learn to compute and visualize the electrostatic and magnetostatic fields for simple configurations
- To analyse the time varying electric and magnetic fields and to understand Maxwell’s equations
- To understand the propagation of electromagnetic waves through different media

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

UNIT II ELECTROSTATICS II
Electric potential - Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factors - Electric field in free space, conductors, dielectric - Dielectric polarization - Dielectric strength - Electric fields in multiple dielectrics - Boundary conditions, capacitance, Energy density, Poisson's and Laplace’s equations - solutions by Direct Integration method, Applications

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

UNIT IV ELECTRODYNAMIC FIELDS
Magnetic Circuits - Faraday’s law - Transformer and motional EMF - Displacement current - Maxwell’s equations (differential and integral form) - Time varying potential - Relation between field theory and circuit theory, Applications.

UNIT V ELECTROMAGNETIC WAVES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to identify appropriate coordinate systems and visualize and understand the practical significance of vector calculus
CO2: Understanding of the basic laws of electromagnetism
CO3: Ability to compute, visualize electrostatic and magnetostatic fields along with practical applications
CO4: Understanding of Maxwell’s equations in different forms and media
CO5: Able to understand the concept of generation and propagation of electromagnetic waves through single and multiple media.
TEXT BOOKS:

REFERENCES:

EE5303 ANALOG ELECTRONICS LT P C 3 0 0 3

OBJECTIVES:
- To be familiar with the structure of basic electronic devices
- To be exposed to the operation and application of electronic devices and their circuits
- To analyze circuit characteristics with signal analysis using Op-amp Ics.
- To design and construct application circuits with Ics as Op-amp, 555, 566 etc.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator ICs and DAC/ADCs

UNIT I ELECTRONIC DEVICES AND THEIR CHARACTERISTICS 9

PN junction diodes - structure, operation and VI characteristics: drift and diffusion current, transient capacitance – BJT, JFET, MOSFET : structure, operation and characteristics ; biasing ; UJT based relaxation oscillator

UNIT II AMPLIFIER CIRCUITS 9

BJT small signal model – Analysis of CE amplifier , Gain and Frequency response - Differential Amplifier - Multi-stage amplifier - Common mode and Differential mode analysis - Current mirror
circuit - Introduction to internal circuit of typical OPAMP.

UNIT III OPAMP AND CHARACTERISTICS

Ideal OPAMP characteristics, DC characteristics, AC characteristics, Voltage -series feedback and voltage -shunt feedback - Frequency response of OPAMP - Basic applications: inverting, non-inverting and differential amplifier circuits, Adder-subtractor circuits - Differentiation and integrator circuits.

UNIT IV APPLICATION OF OPAMPS

Instrumentation amplifiers, First-order and Second order active filters, V to I and I to V converters, Comparators and multi-vibrators, Waveform generators, Clippers and Clampers, Peak detector, D/A converters ( Weighted resistance type and R-2R ladder type), A/D converters ( Flash type, Dual slope type and Successive Approximation types)

UNIT V SPECIAL ICS

555 Timer circuit: Functional block diagram, characteristics & applications - Astable and monostable multivibrator -566 Voltage Controlled Oscillator circuits - PLL Phase Locked Loop applications - Function generator circuit – Linear Voltage regulators

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand the structure and underlying semiconductor physics concepts.
CO2: Ability to design circuits employing electronic devices.
CO3: Analyze, comprehend and design of analog electronic circuits involving OP-AMP
CO4: Analyze, comprehend and design of analog electronic circuits involving timer 555
CO5: Analyze, comprehend and design of analog electronic circuits involving PLL, voltage regulator & other specialties.

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To study the fundamentals of the concept of circuit elements
- To teach the basic laws of networks
- To learn to analyze the AC single phase and three phase circuits
- To understand the Laplace Transforms in the context of circuit representations
- To analyze two port network and its parameters

UNIT I  NETWORK THEOREMS  9

UNIT II  SOLUTION OF FIRST AND SECOND ORDER NETWORKS  9
Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

UNIT III  SINUSOIDAL STEADY STATE ANALYSIS  9
Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

UNIT IV  ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS  9

UNIT V  TWO PORT NETWORK AND NETWORK FUNCTIONS  9
Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

LAB COMPONENT

Hardware and software for Circuit analysis exploration.
1. Solution of circuit problems for Kirchhoff’s voltage and current laws.
2. Application and experimental verification of network theorems (Thevenin’s, Norton’s, Superposition, maximum power transfer Theorem and reciprocity theorem).
3. Study of CRO and measurement of RMS voltage, frequency and power factor.
4. Experimental determination of time constant of series RL, RC circuits.
5. Experimental determination of frequency response of RLC circuits.
6. Design and Simulation of series resonant circuits.
7. Design and Simulation of parallel resonant circuits.
8. Simulation of three phase balanced and unbalanced star & delta connected networks.
9. Experimental determination of power in a three phase circuits
10. Steady state analysis of series RL and RC circuits

TOTAL: 75 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Able to understand the basic concepts of electrical circuits.
CO2: Ability to compute solutions to first and second order networks
CO3: Ability to construct and analyze equation representing AC circuits
CO4: Ability to compute circuit representations quantitatively in Laplace domain
CO5: Able to construct and analyze two port networks and its parameters

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TEXT BOOKS:
3. David A Bell , ” Electric circuits“, Oxford University Press, 2011

REFERENCES:

EE5311 ELECTROMAGNETIC FIELD LABORATORY

OBJECTIVES:
- To learn graphical representation of vector fields (using Mathematical Development Tool)
- To formulate electromagnetic field problems
- To compute and analyze electric and magnetic fields for basic configurations using computational software package and compare with the analytical values
- To compute E/H fields for practical applications.
- To measure electric and magnetic fields using field meters

Graphical Representation of fields (using Mathematical Development Tool)
1. Plotting of vectors (addition, subtraction, dot product and cross product)
2. Computation and Plotting of gradient and divergence fields
3. Computation and Plotting of Curl fields

**Computation of Electric (E) and Magnetic (H) fields (using FEM/FDM packages) for simple configurations**

4. Problem formulation - Boundary conditions - Direct integration method - Concepts of Finite difference method and Finite Element method

5. Computation of Electric field intensity, voltage distribution and capacitance

6. Computation of Magnetic field intensity, inductance and force

7. Calculation of Skin depth

8. Computation of E/H fields for practical applications

**Measurement using field meter**

9. Measurement of Electric Fields (E)

10. Measurement of Magnetic fields (H)

**TOTAL : 60 PERIODS**

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**COURSE OUTCOMES:**

After completion the above subject, students will be able to understand

CO1: Computation, plotting and visual understanding of vectors and vector calculus

CO2: Ability to formulate the electromagnetic field problem to solve numerically

CO3: Ability to compute and analyze the electrostatic and magnetostatic field problem

CO4: Ability to formulate, solve and analyze EM problems for practical applications

CO5: Ability to measure the E/H fields

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**EE5312 ANALOG ELECTRONICS LABORATORY**

**OBJECTIVES:**

- To be familiar with the structure of basic electronic devices
- To be exposed to the operation and application of electronic devices and their circuits
- To analyze circuit characteristics with signal analysis using Op-amp Ics.
- To design and construct application circuits with Ics as Op-amp, 555, etc.
- To study internal functional blocks and the applications of special Ics like Timers, DAC/ADCs

**Experiments On Basic Electronic Devices:**

1. Introduction to circuit simulation package by:
i) PN junction characteristics
ii) Transistor (CE conf) characteristics
iii) JFET characteristics.
2. Frequency response of transistor amplifier circuit.
3. Line and load regulation of Zener regulator
4. UJT - relaxation oscillator circuit
5. Wien bridge oscillator
6. Transistorized Differential amplifier

II Experiments using Linear Integrated Circuits (ICs):
7. OPAMP based amplifier circuits:
   i) Inverting amplifier.
   ii) Non-inverting amplifier and voltage follower
   iii) Differential amplifier and Instrumentation amplifier.
9. Square wave oscillator/ tri-angular wave oscillator.
10. OPAMP based RC -phase shift oscillator
11. 555 - timer IC based astable multi-vibrator
12. OPAMP based precision rectifier circuit/ clipper circuits.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand the structure and underlying semiconductor physics concepts.
CO2: Ability to design circuits employing electronic devices.
CO3: Analyze, comprehend and design of analog electronic circuits involving OP-AMP
CO4: Analyze, comprehend and design of analog electronic circuits involving timer 555
CO5: Analyze, comprehend and design of analog electronic circuits involving ADC & DAC other specializes.

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TOTAL: 60 PERIODS
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:

Select slide templates, layout and themes
Formatting slide content and using bullets and numbering
Insert and format images, smart art, tables, charts
Using Slide master, notes and handout master
Working with animation and transitions
Organize and Group slides
Import or create and use media objects: audio, video, animation
Perform slideshow recording and Record narration and create presentable videos

TOTAL: 30 PERIODS

OUTCOMES:
On successful completion the students will be able to

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

GE5251 ENVIRONMENTAL SCIENCES

OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodive
- rsity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and environmental issues.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of environment - need for public awareness - concept of an ecosystem - structure and function of an ecosystem - producers, consumers and decomposers - energy flow in the ecosystem - ecological succession - food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to biodiversity definition: genetic, species and ecosystem diversity - bio geographical classification of India - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels - India as a mega-diversity nation - hot-spots of biodiversity - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - endangered and endemic species of India - conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common
plants, insects, birds Field study of simple ecosystems - pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - soil waste management: causes, effects and control measures of municipal solid wastes - role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site - Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets - river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2: To identify the causes, effects and environmental pollution and natural disasters and contributeto the preventive measures in the immediate society.
CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4: To recognize different forms of energy and apply them for suitable applications in for technological advancement and societal development.
CO5: To demonstrate the knowledge of societal activity on the long and short term environmental
issues and abide by the legal provisions, National and International laws and conventions in professional and personal activities and to identify and analyse effect of population dynamics on human value education, consumerism and role of technology in environmental issues.

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EE5401 DIGITAL ELECTRONICS LT P C 3 0 0 3

OBJECTIVES:
1. To introduce the fundamentals of combinational and sequential digital circuit.
2. To study various number systems and to simplify the mathematical expressions using Boolean functions word problems
3. To study implementation of combinational circuits using Gates’ and MSI Devices.
4. To study the design of various synchronous and asynchronous circuits
5. To introduce digital simulation techniques for development of application oriented logic circuit

UNIT I NUMBER SYSTEMS, BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS 9
Number system, error detection, corrections & codes conversions, Boolean algebra: De-Morgan’s theorem, switching functions and minimisation using K-maps & Quine McCluskey method

UNIT II DESIGN OF COMBINATIONAL LOGIC CIRCUITS USING GATES AND MSI DEVICES 9
Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers, Realisation of Boolean Functions using MSI devices, memories and PLA.

UNIT III  ANALYSIS AND DESIGN OF SYNCHRONOUS SEQUENTIAL CIRCUITS  9
Flip flops - SR, D, JK and T, shift registers, counters, state assignments analysis and design of synchronous sequential circuits, state diagram; state reduction

UNIT IV  ANALYSIS AND DESIGN OF ASYNCHRONOUS SEQUENTIAL CIRCUITS  9
Latches - SR - D, Asynchronous sequential logic circuits-Transition table, flow table - race conditions - circuits with latches, analysis of asynchronous sequential logic circuits - introduction to design - implication table

UNIT V  LOGIC FAMILIES AND VHDL  9

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: To understand and examine the structure of various number systems and its application in digital design to solve real world problems
CO2: Analyze and design combinational logic circuits using gates and MSI devices.
CO3: Analyze and Design synchronous sequential logic circuits using Flip flops and gates
CO4: Analyze and Design Asynchronous sequential logic circuits using Latches and gates
CO5: Selection of logic families and skill development for application specific digital circuit design using VHDL

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To make the students familiarize various representations of systems.
- To make the students analyze the stability of linear systems in time domain and frequency domain.
- To make the students analyze the stability of linear systems in frequency domain.
- To make the students design compensator based on the time and frequency domain Specifications.
- To develop linear models mainly state variable model and Transfer function model

UNIT I  MODELING OF LINEAR TIME INVARIANT SYSTEM (LTIV)  9
Control system: Open loop and Closed loop - Feedback control system characteristics - First principle modeling: Mechanical, Electrical and Electromechanical systems - Transfer function representations: Block diagram and Signal flow graph.

UNIT II  TIME DOMAIN ANALYSIS  9
Standard test inputs - Time responses - Time domain specifications - Stability analysis:Concept of stability - Routh Hurwitz stability criterion - Root locus: Construction and Interpretation. Effect of adding poles and zeros

UNIT III  FREQUENCY DOMAIN ANALYSIS  9
Bode plot, Polar plot and Nyquist plot: - Frequency domain specifications Introduction to closed loop Frequency Response. Effect of adding lag and lead compensators.

UNIT IV  STATE VARIABLE ANALYSIS  9
State variable formulation - Non uniqueness of state space model - State transition matrix -Eigen values - Eigen vectors-Free and forced responses for Time Invariant and Time Varying Systems - Controllability – Observability

UNIT V  DESIGN OF FEED BACK CONTROL SYSTEM  9

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Represent simple systems in transfer function and state variable forms.
CO2: Analyse simple systems in time domain.
CO3: Analyse simple systems in frequency domain.
CO4: Infer the stability of systems in time and frequency domain.
CO5: Interpret characteristics of the system and find out solution for simple control problems.
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**TEXT BOOKS:**

**REFERENCES:**
4. NPTEL Video Lecture Notes on “Control Engineering” by Prof. S.D. Agashe, IIT Bombay
COURSE OBJECTIVES:

This course is to provide the fundamental knowledge to the students to

- Understand the concepts of magnetic circuits.
- Understand the concepts of induced emf and torque in both stationary and rotating machines.
- Understand the operation of dc machines.
- Analyse the differences in operation of different dc machine configurations.
- Analyse the single phase and three phase transformers circuits.

UNIT I  MAGNETIC FIELDS AND MAGNETIC CIRCUITS  6
Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.

UNIT II  ELECTROMAGNETIC FORCE AND TORQUE  9
B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency

UNIT III  DC MACHINES  8
Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

UNIT IV  DC MACHINE - MOTORIZING AND GENERATION  7
Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines

UNIT V  TRANSFORMERS  15


and three-phase transformers, Autotransformers – construction principle, applications and comparison with two winding transformer, Magnetizing current effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers, Cooling of transformers.

TOTAL : 45 PERIODS

NOTE : The question paper for this course can be set with weightage of marks distribution as per the distribution of contact periods

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Understand the concepts of magnetic circuits.
CO2: Understand the principles of induced emf's and torque in stationary and rotating machines.
CO3: Understand the operation of dc machines.
CO4: Analyse the differences in operation of different dc machine configurations.
CO5: Analyse the single phase and three phase transformers circuits.

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TEXT / REFERENCES:
OBJECTIVES

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

UNIT I  CONCEPTS OF MEASUREMENTS

Instruments: classification, applications - Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement - Statistical evaluation of measurement data.

UNIT II  MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS

Classification of instruments - moving coil and moving iron meters - Induction type, dynamometer type wattmeters - Energy meter - Megger - Instrument transformers (CT & PT).

UNIT III  AC/DC BRIDGES AND INSTRUMENTATION AMPLIFIERS


UNIT IV  TRANSUDCERS FOR MEASUREMENT OF NON-ELECTRICAL PARAMETERS

Classification of transducers - Measurement of pressure, temperature, displacement, flow, angular velocity - Digital transducers - Smart Sensors

UNIT V  DIGITAL INSTRUMENTATION


TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the above subject, students will be able to understand

CO1: Able to understand the fundamental art of measurement in engineering.
CO2: Able to understand the structural elements of various instruments.
CO3: Able to understand the importance of bridge circuits.
CO4: Able to understand about various transducers and their characteristics by experiments.
CO5: Able to understand the concept of digital instrumentation and virtual instrumentation by experiments.

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REFERENCE BOOKS:


LIST OF EXPERIMENTS

1. Static and Dynamic characteristics of Electrical and Non electrical sensors.
2. Design of Resistive, Inductive and Capacitive Bridges.
4. Design of A/D and D/A converters.
5. Calibration of analog instruments.
7. Study of characteristics of Optical Sensors.
8. PLC programming for Process Control Applications.
9. Modeling of physical systems like electrical and mechanical systems.
10. PC Based Data Acquisition system.

TOTAL: 30 PERIODS

EE5411 ELECTRICAL MACHINES LABORATORY – I

OBJECTIVES

- To study the load characteristics of DC machines and transformers.
- To determine the performance characteristics of DC machines and transformers using direct and indirect tests.
- To study the different speed control methods of DC shunt motor.
- To study the need for starters in DC motors.
- To study the various connections in three phase transformers.
LIST OF EXPERIMENTS

1. Open circuit and load characteristics of a separately excited DC Generator
2. Open circuit and load characteristics of DC shunt Generator
3. Speed control of DC shunt motor.
4. Load test on DC shunt motor.
5. Load test on DC series motor
6. Load test of DC compound motor
7. Swinburne’s test.
8. Hopkinson’s Test.
10. Separation of no load losses in a single phase transformer.
11. Sumpner’s test
13. Study of Starters

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Steady State Performance characteristics of DC machines and Transformers
CO2: Speed control of DC shunt motor above and below rated speed
CO3: DC motor starters and Three phase transformer connections
CO4: Application of the Predetermination tests on Electrical Machines
CO5: Comparison of performance of different types of DC machines

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OBJECTIVES

- To make the students familiarize various representations of systems.
- To make the students analyze the stability of linear systems in time domain and frequency domain.
- To make the students design compensator based on the time and frequency domain Specifications.
- To develop linear models mainly state variable model and Transfer function model
- To make the students to design a complete closed loop control system for the physical systems

LIST OF EXPERIMENTS

1. Analog (op amp based) simulation of linear differential equations
2. Numerical Simulation of given non linear differential equations
3. Real time simulation of differential equation
4. Mathematical modeling and simulation of physical systems in at least two fields
   - Mechanical
   - Electrical
   - Chemical process
5. System Identification through process reaction curve
6. Stability analysis using Pole zero maps and Routh Hurwitz Criterion in simulation platform
7. Root Locus based analysis in simulation platform
8. Determination of transfer function of a physical system using frequency response and Bode’s asymptotes
9. Design of Lag, lead compensators and evaluation of closed loop performance
10. Design of PID controllers and evaluation of closed loop performance
11. Discretization of continuous system and effect of sampling
12. Test of controllability and observability in continuous and discrete domain in simulation platform
13. State feedback and state observer design and evaluation of closed loop performance
14. Mini Project 1: Simulation of complete closed loop control systems including sensor and actuator dynamics
15. Mini Project 2: Demonstration of a closed loop system in hardware

TOTAL : 60 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: To model and analyze simple physical systems and simulate the performance in analog and digital platform
CO2: To design and implement simple controllers in standard forms.
CO3: To design compensators based on time and frequency domain specifications
CO4: To design a complete closed control loop and evaluate its performance for simple physical systems
CO5: To analyze the stability of a physical system in both continuous and discrete domain
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HM5403    WORK ETHICS, CORPORATE SOCIAL RESPONSIBILITY AND GOVERNANCE  LT P C  3 0 0 3

OBJECTIVES:

- To impart the value of professional practices with code of conduct and ethical values
- Discuss the various outlooks of roles and responsibilities with work ethics.
- Introduce the Indian constitutional statutes for ethical practices by citizens
- Analyze the ethical commitments to be hold by industry with protecting environment
- Insist on corporate and social responsibilities through Governance practices and regulation

UNIT I    INTRODUCTION  9
Ethics - Definition & nature, Characteristics, Attributes of Ethics - Business Ethics; Ethical theories; Causes of unethical behavior; Ethical abuses; Work ethics; Code of conduct; Public good.

UNIT II    ETHICS THEORY AND BEYOND  9
Management of Ethics - Ethics analysis [ Hosmer model ]; Ethical dilemma; Ethics in practice - ethics for managers; Role and function of ethical managers- Comparative ethical behaviour of managers; Code of ethics; Competitiveness, organizational size, profitability and ethics; Cost of ethics in Corporate ethics evaluation.

UNIT III    LEGAL ASPECTS OF ETHICS  9
Political – legal environment; Provisions of the Indian constitution pertaining to Business; Political setup – major characteristics and their implications for business; Prominent features of MRTP & FERA. Social – cultural environment and their impact on business operations, Salient features of Indian culture and values.

UNIT IV    ENVIRONMENTAL ETHICS  9
Economic Environment; Philosophy of economic grow and its implications for business, Main features of Economic Planning with respect to business; Industrial policy and framework of government contract over Business; Role of chamber of commerce and confederation of Indian Industries.

UNIT V    CORPORATE SOCIAL RESPONSIBILITY AND GOVERNANCE  9
Definition- Evolution- Need for CSR; Theoretical perspectives; Corporate citizenship; Business practices; Strategies for CSR; Challenges and implementation; Evolution of corporate governance; Governance practices and regulation; Structure and development of boards; Role of capital market 84 and government; Governance ratings; Future of governance- innovative practices; Case studies with lessons learnt.

TOTAL : 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Understand ethical issues in workplace and have good practices in professional duties.
CO2: Learn roles and responsibilities in professional career as a team worker
CO3: Understand the legal aspects in Indian constitutional for protection of societal values
CO4: Analyze the economical development by industry with importance to environment protection
CO5: Understand need of good Governance in a corporate with ethical organizational behavior.

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TEXT BOOKS:

REFERENCES:
3. Philip Kotler and Nancy Lee, Corporate social responsibility: doing the most good for company and your cause, Wiley, 2005.
5. Satheesh kumar, Corporate governance, Oxford University Press, 2010.

EE5501 ELECTRICAL MACHINES – II

COURSE OBJECTIVES:
This course provides the fundamental knowledge to the students to

- Understand the concept of windings, MMFs and rotating magnetic fields.
- Understand the operation of ac machines.
- Analyse performance characteristics of ac machines.

UNIT I FUNDAMENTALS OF AC MACHINE WINDINGS
Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn Coil – active portion and overhang; full-pitch coils, concentrated winding, distributed winding, Winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed Current through winding - concentrated and distributed, Sinusoidally distributed winding, Winding distribution factor
UNIT II PULSATING AND REVOLVING MAGNETIC FIELDS

Constant magnetic field, pulsating magnetic field – alternating current in windings with Spatial displacement, Magnetic field produced by a single winding – fixed current andAlternating current
Pulsating fields produced by spatially displaced windings, Windings Spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

UNIT III INDUCTION MACHINES


UNIT IV SINGLE-PHASE INDUCTION MOTORS

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications

UNIT V SYNCHRONOUS MACHINES


TOTAL : 45 PERIODS

NOTE: The question paper for this course can be set with weightage of marks distribution as per the distribution of contact periods

COURSE OUTCOMES:

After completion the above subject, students will be able to understand
CO1: Understand the concepts of windings, MMFs and rotating magnetic fields.
CO2: Understand the operation of ac machines.
CO3: Analyse the performance characteristics of ac machines.
CO4: Analyse the starting and speed control of ac machines.
CO5: Understand the field applications of ac machines.

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EE5502  MICROPROCESSORS AND MICROCONTROLLERS

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

UNIT I  INTRODUCTION TO 8085 ARCHITECTURE
Functional block diagram – Memory interfacing - I/O ports and data transfer concepts - Timing Diagram – Interrupt structure,

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

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

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

UNIT V  INTRODUCTION TO ADVANCED ARCHITECTURE
ARM Cortex-M0 – overview - Programmer’s Model - Memory System Overview - System ControlBlock - Microcontroller Start sequence - Inputs and Outputs - Development Flow

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to write assembly language program for microprocessor and microcontroller
CO2: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller
CO3: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring..
CO4: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.
CO5: Ability to understand and appreciate advanced architecture evolving microprocessor field

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

EE5503 TRANSMISSION AND DISTRIBUTION LT P C 3 0 0 3

OBJECTIVES:
- To impart knowledge about the configuration of the electrical power system
- To study the line parameters and interference with neighbouring circuits
- To analyse and model different components of power system
- To learn different insulators and underground cables
- To compute sag and conductor length for different weather conditions.

UNIT I STRUCTURE OF POWER SYSTEM 9
Structure of electric power system: generation, transmission and distribution; overhead and underground systems, Types of AC and DC distributors-distributed and concentrated loads-voltage tolerances - interconnection-EHVAC and HVDC transmission-Introduction to FACTS.

UNIT II TRANSMISSION LINE PARAMETERS 9
Parameters of single and three phase transmission lines with single and double circuits-Resistance, inductance and capacitance of solid ,stranded and bundled conductors, conductor types-Symmetrical and unsymmetrical spacing and transposition-application of self and mutual GMD; skin and proximity effects-Effects of earth on the capacitance of the transmission line - interference with neighbouring communication circuits, corona discharge, factors affecting corona

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9
Classification of lines-short line, medium line and long line-Evaluation of A,B,C,D constants-equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance and surge impedance loading; transmission efficiency and voltage regulation, real and reactive power flow in lines, Power-circle diagrams, methods of voltage control ;Ferranti effect.
UNIT IV INSULATORS AND CABLES
Insulators-Types, voltage distribution in insulator string, improvement of string efficiency, Underground cables-Types of cables, Parameters of cable, Grading of cables, Power factor and heating of cables, Capacitance of 3-core belted cable, D.C cables.

UNIT V MECHANICAL DESIGN OF LINES AND GROUNDING
Mechanical design of transmission line - sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Sub-station Layout (AIS, GIS), Methods of grounding.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand structure of power system with different voltage levels
CO2: Ability to compute line parameters for different configurations
CO3: Ability to model transmission line and to determine the performance of line
CO4: Ability to choose various insulators and cables for transmission and distribution
CO5: Ability to do mechanical design of transmission line and grounding

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TEXT BOOKS:

REFERENCES:
EE5511  ELECTRICAL MACHINES LABORATORY – II  LT P C  0 0 4 2

OBJECTIVES
• To study the performance characteristics of induction motors and synchronous induction motor.
• To study the predetermined of voltage regulation of synchronous generator.
• To study the variation in reluctance in salient pole machine.
• To predetermined the characteristics of single phase and three phase induction motors.

LIST OF EXPERIMENTS
2. Slip test and determination of \( X_g \) and \( X_c \).
4. Load test on three phase induction motor.
5. Load test on single phase induction motor.
10. Load characteristics of induction generator.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Performance characteristics of induction and synchronous machines using direct and in direct methods.

CO2: Regulation of three phase alternator using the predetermination methods

CO3: Saliency nature of synchronous machine.

CO4: Performance of single-phase induction motor.

CO5: Starting and Speed control of ac machines.
OBJECTIVES:

- To perform simple arithmetic operations using assembly language program and study the addressing modes & instruction set of 8085 & 8051
- To develop skills in simple program writing in assembly languages
- To write an assembly language program to convert Analog input to Digital output and Digital input to Analog output.
- To perform interfacing experiments with µP8085 and µC8051
- To study various digital integrated circuits used in simple system configuration.

Programming exercises / Experiments with µP8085:
1. Simple arithmetic operations: Multi precision addition / subtraction /multiplication / division.
3. Interface Experiments:
   - A/D Interfacing.
   - D/A Interfacing.
   - Traffic light controller

Programming exercises / Experiments with µC8051:
5. Simple arithmetic operations with 8051: Multi precision addition / subtraction / multiplication / division.
7. Interface Experiments:
   - A/D Interfacing.
   - D/A Interfacing.
   - Traffic light controller
8. Stepper motor controller interface.

Experiments with Digital ICs :
9. Study of Basic Digital IC’s:
   - (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS, FF, D FF)
10. Implementation of Boolean Functions, Adder/ Subtractor circuits ; Realizing given function with minimum number of gates by minimization methods.
11. Study of binary / BCD counters, modulo-n counters
12. Design and implementation of Synchronous sequential counters.
13. Programming ARM architecture with software tools

TOTAL : 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to design and implement combinational logic circuits and to analysis simple sequentiallogic circuits.
CO2: Ability to write assembly language program for microprocessor and microcontroller
CO3: Ability to design and implement interfacing of peripheral with microprocessor and microcontroller
CO4: Ability to analyze, comprehend, design and simulate microprocessor based systems used for control and monitoring..
CO5: Ability to analyze, comprehend, design and simulate microcontroller based systems used for control and monitoring.
OBJECTIVES:

- To impart knowledge on the need for “power system analysis” and model various power system components.
- To formulate the power balance equations and to conduct the power flow analysis by Gauss-Seidel and Newton-Raphson methods.
- To model and carry out short circuit studies of power system for symmetrical faults and to determine the fault levels of different buses.
- To learn about the symmetrical components and their application to carry out short circuit studies of power system for unsymmetrical faults and to determine the fault levels of different buses.
- To model and analyze the stability of the power system due to balanced faults by equal area criteria and explicit integration methods.

UNIT I  POWER SYSTEM OVERVIEW  9
Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive network-, Bus admittance matrix from primitive parameters - Representation of off-nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II  POWER FLOW ANALYSIS  9

UNIT III  SYMMETRICAL FAULT ANALYSIS  9
Importance of short circuit studies-Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin’s theorem - Bus Impedance matrix by building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV  UNSYMMETRICAL FAULT ANALYSIS  9
Symmetrical components - Sequence impedances – Sequence circuits of synchronous machine, transformer and transmission line-Sequence networks - Analysis of unsymmetrical faults: single-line-to-ground, line-to-line and double-line-to-ground using Thevenin’s theorem and Z-Bus- computation of
post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS


TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Model the various power system components for steady-state analysis.
CO2: Carry out the power flow analysis by Gauss-Seidel and Newton-Raphson methods.
CO3: Conduct the fault analysis of power system for balanced faults.
CO4: Carry out the short circuit analysis of the power system for unbalanced faults using symmetrical component theory.
CO5: Compute the stability of the system with the help of equal area criteria and Modified-Euler and Runge-Kutta fourth order methods.

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TEXT BOOKS:

REFERENCES
OBJECTIVES:

- To understand the various applications of Power electronic devices for conversion, control and conditioning of the electrical power and to get an overview of different types of power semiconductor devices and their dynamic characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and various configurations of AC voltage controller.

UNIT I SWITCHING POWER SUPPLIES 9

MOSFET dynamic behaviour - driver and snubber circuits - low power high switching frequency switching Power supplies, buck, boost, buck-boost converters – Isolated topologies – resonant converters - switching loss calculations and thermal design.

UNIT II INVERTERS 9

IGBT : Static dynamic behaviour - single phase half bridge and full bridge inverters - VSI :(1phase and three phase inverters square wave operation) - Voltage control of inverters single, multi pulse, sinusoidal, space vector modulation techniques- various harmonic elimination techniques-CSI

UNIT III UNCONTROLLED RECTIFIERS 9

Power Diode - half wave rectifier - mid-point secondary transformer based full wave rectifier - bridge rectifier - voltage doubler circuit - distortion factor - capacitor filter for low power rectifiers - LC filters - Concern for power quality - three phase diode bridge.

UNIT IV CONTROLLED RECTIFIERS 9

SCR-Two transistor analogy based turn- ON - turn ON losses - thermal protection - controlled converters (1 pulse, 2 pulse, 3 pulse, 6 pulse) - displacement factor - ripple and harmonic factor - power factor mitigation, performance parameters - effect of source inductance - inverter angle limit.

UNIT V AC PHASE CONTROLLERS 9

TRIAC triggering concept with positive and negative gate pulse triggering, TRIAC based phase controllers - various configurations for SCR based single and three phase controllers.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: To understand operation of semiconductor devices and dynamic characteristics and to design & analyze low power SMPS

CO2: Analyze the various uncontrolled rectifiers and design suitable filter circuits

CO3: Analyze the operation of the n-pulse converters and evaluate the performance parameters

CO4: Understand various PWM techniques and apply voltage control and harmonic elimination methods to inverter circuits.

CO5: Understand operation of AC voltage controllers and its applications
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**TEXT BOOKS:**


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**EE5603 PROTECTION AND SWITCHGEAR**

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**OBJECTIVES:**

- To teach the principles and need for protection schemes by different fault current calculations
- To teach the basic principles, construction and characteristics of different Electromagnetic relays
- To learn to protect different power equipments like transformer, generator etc.,
- To teach different aspects of static relays and numerical protection schemes
- To learn the principles, construction and problems associated with different types of circuit breaker

**UNIT I PROTECTION SCHEMES**

Principles and need for protective schemes - nature and causes of faults - types of faults - fault current calculation – Zones of protection and essential qualities of protection. Methods of Neutral grounding.

**UNIT II ELECTROMAGNETIC RELAYS**

Operating principles of relays - Torque equation - R-X diagram - Electromagnetic Relays - Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

**UNIT III APPARATUS PROTECTION**

Application of Current transformers and Potential transformers in protection schemes - Sources of error. Protection of transformer, generator, motor, bus bars and transmission line.

**UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION**

Static relays - Phase, Amplitude Comparators - Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distant protection of transmission lines.
UNIT V  CIRCUIT BREAKERS

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking - re-striking voltage and recovery voltage - rate of rise of recovery voltage - current chopping - interruption of capacitive current - resistance switching - Types of circuit breakers - air, oil, SF6 and vacuum circuit breakers - comparison of different circuit breakers - Rating and selection of Circuit breakers.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Ability to analyse different types of faults and their effects on the power system and understand the practical significance of protection zones

CO2: Understanding the basic principles, construction and characteristics of different Electromagnetic relays

CO3: Ability to protect different power equipments like transformer, generator etc., against various electrical faults

CO4: Understanding different aspects of static relays and numerical protection schemes

CO5: Able to understand the principles, construction, selection and problems associated with Different types of circuit breaker

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To study the VI characteristics of SCR, TRIAC, MOSFET and IGBT.
- To analyze the performance of semiconverter, full converter, step up, step down choppers by simulation and experimentation.
- To study the behaviour of voltage waveforms of PWM inverter applying various modulation techniques
- To design and analyze the performance of SMPS
- To study the performance of AC voltage controller by simulation and Experimentation.

1. Characteristics of SCR and TRIAC

2. Characteristics of MOSFET and IGBT

3. AC to DC half controlled converter

4. AC to DC fully controlled Converter

5. Step down and step up MOSFET based choppers

6. IGBT based single phase PWM inverter

7. IGBT based three phase PWM inverter

8. AC Voltage controller

9. Switched mode power converter.

10. Simulation of PE circuits (1Φ&3Φsemiconverter, 1Φ& 3Φfullconverter, dc-dc converters, ac voltage controllers).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: Determine the characteristics of SCR, IGBT, TRIAC, MOSFET and IGBT

and Find the transfer characteristics of full converter, semi converter, step up and step downchoppers by simulation experimentation.

CO2: Understand the performance of AC voltage controllers by simulation and experimentation.

CO3: Analyze the voltage waveforms for PWM inverter using various modulation techniques.

CO4: Design and experimentally verify the performance of basic DC/DC converter topologies used for SMPS.

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OBJECTIVES:
• To design armature and field systems for D.C. machines.
• To design core, yoke, windings and cooling systems of transformers.
• To design stator and rotor of induction machines and synchronous machines.

LIST OF EXPERIMENTS
1. Design of field system
2. Design of solenoid, relay
3. Design of Field Windings of DC machine
4. Design of armature winding of DC machine
5. Calculation of Armature Main Dimensions of DC machine
6. Complete design of armature winding of DC machine
7. Transformer electrical design
8. Transformer thermal design
9. Complete design of a transformer and performance evaluation calculation
10. Stator design of AC machine
11. Rotor design of Induction motor
12. Complete design of an Induction motor and performance evaluation calculation
13. Complete design of a synchronous machine and performance evaluation calculation
14. Mini project: Design of special machines like PMDC / BLDC/SRM/PMSM

TOTAL: 60 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to design armature and field systems for D.C. machines.
CO2: Ability to draw the winding diagram
CO3: Ability to design transformers.
CO4: Ability to design stator and rotor of induction machines and synchronous machines.
CO5: Ability to design special machines using computer

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TOTAL: 60 PERIODS
OBJECTIVES:

- To understand steady state operation and transient dynamics of a motor load system.
- To study and analyze the operation of the converter / chopper fed dc drive, both qualitatively and quantitatively.
- To study and understand the operation and performance of AC Induction motor drives.
- To study and understand the operation and performance of AC Synchronous motor drives.
- To analyze and design the current and speed controllers for a closed loop solid state DC motor drives.

UNIT I DRIVE CHARACTERISTICS


UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE

Steady state analysis of the single and three phase converter fed separately excited DC motor drive - continuous and discontinuous conduction - Time ratio and current limit control - 4 quadrant operation of converter / chopper fed drive.

UNIT III INDUCTION MOTOR DRIVES

Stator voltage control - energy efficient drive - v/f control - constant air gap flux - field weakening mode - voltage / current fed inverter - closed loop control.

UNIT IV SYNCHRONOUS MOTOR DRIVES

V/f control and self-control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous motor.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES

Transfer function for DC motor / load and converter – closed loop control with current and speed feedback – armature voltage control and field weakening mode – design of controllers; current controller and speed controller-converter selection and characteristics.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: Understand the basic requirements of motor selection for different load profiles.
CO2: Analyse the steady state behavior and stability aspects of drive systems.
CO3: Simulate the DC drive using converter and chopper control.
CO4: Simulate the AC drive.
CO5: Design the controller for electrical drives.
TEXT BOOKS:

REFERENCES:

EE5702 POWER SYSTEM OPERATION AND CONTROL LT P C 3 0 0 3

OBJECTIVES:
To impart knowledge on the
- Significance of power system operation and control.
- Real power-frequency interaction and design of power-frequency controller.
- Reactive power-voltage interaction and the compensators for maintaining the voltage profile.
- Generation scheduling and economic operation of power system.
- SCADA and its application for real time operation and control of power systems.

UNIT I INTRODUCTION
Power scenario in Indian grid – National and Regional load dispatching centers – requirements of
good power system - necessity of voltage and frequency regulation - real power vs frequency and
reactive power vs voltage control loops - system load variation, load curves - load forecast - basic
concepts of economic dispatch - unit commitment - load shedding and islanding - deregulation -
Tariff: characteristics & types.

UNIT II REAL POWER - FREQUENCY CONTROL
Basics of speed governing mechanisms and modeling - speed regulation of two generators in parallel
- Load Frequency Control (LFC) of single area system - static and dynamic analysis - LFC of two area
system - tie line modeling - block diagram representation of two area system - static and dynamic
analysis - tie line with frequency bias control - state variable model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER – VOLTAGE CONTROL

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM
Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - lambda-iteration method - base point and participation factors method. Statement of Unit Commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list – special aspects of short term and long term hydrothermal scheduling problems.

UNIT V COMPUTER CONTROL OF POWER SYSTEM
Need of computer control of power system - concept of energy control centers and functions - PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation – measurements and errors - weighted least square estimation - various operating states - state transition diagram.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Analyze the day-to-day operation of electric power system.
CO2: Analyze the control actions that are implemented to meet the minute-to-minute variation of system real power demand.
CO3: Analyze the compensators for reactive power control.
CO4: Prepare day ahead and real time economic generation scheduling.
CO5: Understand the necessity of computer control of power systems.

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TEXT BOOKS:
REFERENCES

EE5703 HIGH VOLTAGE ENGINEERING LT P C
3 0 0 3

OBJECTIVES:
• To teach over voltage phenomenon and insulation coordination in electrical Power systems
• To impart knowledge on breakdown mechanisms of different dielectrics
• To learn about high voltage and high current generation techniques
• To teach the different measurements techniques of high voltages & currents
• To learn how to conduct dielectric tests on various electrical equipment and about safety precautions in HV Labs

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 6
Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages – Estimation of over voltages- Reflection and Refraction of Travelling waves- Protection against over voltages, surge diverters, surge modifiers.

UNIT II DIELECTRIC BREAKDOWN 12
Gaseous breakdown in uniform and non-uniform fields – Corona discharges - Vacuum breakdown - Characteristics, Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality - Breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9
Generation of High DC, AC, impulse voltages and currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9
High Resistance with series ammeter - Dividers, Resistance, Capacitance and Mixed dividers -Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters - Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING OF EQUIPMENT AND HIGH VOLTAGE LABORATORIES 9
High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, bushing, isolators, circuit breakers and transformers, high voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H.V. Labs.

TOTAL: 45 PERIODS

85
• Note- Generation , Measurement of High Voltages and Testing of Power Apparatus to be demonstrated in High voltage Laboratory

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

**CO1**: Understanding the over voltage phenomenon and insulation coordination in electrical Power systems

**CO2**: Ability to understand the various breakdown mechanisms of different dielectrics

**CO3**: Able to analyse and generate high voltage and high current

**CO4**: Understanding measurements techniques of high voltages & currents with their relative merits and demerits

**CO5**: Ability to conduct dielectric tests on various electrical equipment with safety precautions in HV Labs

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TEXT BOOKS:

3. Rakosh Das Begamudre, High Voltage Engineering, Problems and Solutions, New Age International Publishers, New Delhi, 2010
5. Various IS standard for HV Laboratory Techniques and Testing.

REFERENCES:

6. Dieter Kind, Kurt Feser, High Voltage Test Techniques, Reed educational and professional publishing ltd. (Indian edition), New Delhi-200
OBJECTIVES:

- To provide better understanding of modeling of transmission lines in impedance and admittance forms.
- To apply iterative techniques for power flow analysis.
- To carry out short circuit and stability studies on power system.
- To analyze the load - frequency and voltage controls.
- To analyze optimal dispatch of generators and perform state estimation.

LIST OF EXPERIMENTS

1. Computation and Modelling of Transmission Lines
2. Formation of Bus Admittance and Impedance Matrices
4. Power Flow Analysis using Newton Raphson Method
5. Symmetric and unsymmetric fault analysis
6. Transient stability analysis of SMIB System
7. Load - Frequency Dynamics of Single-Area and Two-Area Power Systems
8. Stability analysis of AVR
9. Voltage control with SVC and STATCOM
10. Economic Dispatch in Power Systems
11. State estimation: WLSE

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand:

CO1: Model the transmission lines.
CO2: Perform power evacuation studies for future generation and transmission system planning.
CO3: Analyze the day-to-day operation of power system with respect to voltage and frequency.
CO4: Analyze the stability of AVR.
CO5: Perform optimal scheduling of generators and compute the state of the power system.

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OBJECTIVES:

- To understand the basic concepts in C Programming Language.
- To introduce the students to the basic data structures such as arrays, stacks and queues
- To teach the concept of pointers and string handling in C
- To learn about files and various operations on files
- To develop C programs for implementing simple data structures, sorting and searching techniques.

UNIT I  C PROGRAMMING BASICS


UNIT II  FUNCTIONS AND ARRAYS

Functions in C - Designing Structured Programs - Return Types in Functions - Storage Classes - Scope - Passing Arguments: Call by Value and Call by Reference - Type Qualifiers - Recursion and Recursive Functions - Example C Programs. Arrays: Concepts - Using Arrays in C - Single and Multi-Dimensional Arrays in C - Simple C Programs using Arrays: Array order Reversal - Array Counting and Histogramming - Finding the Maximum Number and its Position in an Array.

UNIT III  POINTERS AND STRINGS

Pointers: Basic Concepts - Pointers for inter function communication - Pointers to Pointers - Pointer Applications - Arrays and Pointers - Pointer Arithmetic and arrays - Passing an array to a function - Memory Allocation functions - Array of pointers - Programming Applications - Pointers to void - Pointers to Functions. Strings: Concepts - C Strings - String Input / Output Functions - Arrays of strings - String Manipulation Functions - String / Data conversion - C program examples

UNIT IV  STRUCTURING DATA AND FILES

Enumerated, Structure and Union Types - The Type Definition, Enumerated types, Structures - Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples - Command Line Arguments. Files: Concept of a File - Streams - Text files and binary files - Differences between Text and Binary files - Opening and Closing Files - File Input/Output Functions - File Status Functions - Positioning functions - C program examples.

UNIT V  Simple Programs in C


TOTAL : 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Develop modular programs using C
CO2: Develop programs for implementing simple data structures in C
CO3: Write programs for Array processing, Sorting and Searching
CO4: Confidence to develop C programs for complex problems
CO5: Confidence to learn any programming language on his own

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TEXT BOOKS:

REFERENCES:

EE5002 EMBEDDED SYSTEM DESIGN LT P C
3 0 0 3

OBJECTIVES:
• Introduction to Building Blocks of a Embedded System and software Tools
• To understand role of Input/output interfacing with Bus Communication protocol.
• To understand ISR and scheduling for multitask process.
  Introduce the basics of a Real time operating system
• Example tutorials to discuss applications based on embedded design approaches

UNIT I  INTRODUCTION TO EMBEDDED SYSTEMS
Introduction to Embedded Systems - The build process for embedded systems- Structural units for a Embedded microcontroller , selection of processor & memory devices- DMA - Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock-- IDE, assembler, compiler, linker, simulator, debugger, Incircuit emulator,Target Hardware Debugging, Boundary Scan

UNIT II  EMBEDDED NETWORKING
UNIT III INTERRUPTS SERVICE MECHANISM AND DEVICE DRIVERS  
Programmed-I/O busy-wait approach without interrupt service mechanism-ISR concept-interrupt sources - multiple interrupts - context and periods for context switching, interrupt latency and deadline - Introduction to Device Drivers

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN  
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-shared memory, message passing-, Interprocess Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of commercial Real time Operating systems: VxWorks, чC/OS-II, RT Linux

UNIT V EMBEDDED SYSTEM APPLICATION WITH DEVELOPMENT  
Case Study: Washing Machine- Automotive Application- RFID- System, Application, Embedded Product Development Life Cycle, Objective, Need, and different Phases & Modelling of the EDLC

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand

CO1: Able to understand the hardware functionals and software strategies required to develop various Embedded systems
CO2: Understanding of the basic differences of various Bus communication standards
CO3: Learn to incorporate interface as Interrupt services
CO4: Observe various scheduling algorithms through Real time operating system.
CO5: Ability to involve embedded concepts for developing automation applications.

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REFERENCES:
OBJECTIVES:

- To provide knowledge of the operation and dynamics of electrical vehicles
- To impart knowledge on vehicle control for standard drive cycles of electrical vehicles (EVs)
- To estimate the energy requirement of EVs and Hybrid Electric Vehicles (HEVs)
- To provide knowledge about different energy sources and energy management in HEVs
  - To provide knowledge of supervisory control of EVs

UNIT I ELECTRIC VEHICLE ARCHITECTURE
9

UNIT II MECHANICS OF ELECTRIC VEHICLES
9
Fundamentals of vehicle mechanics - tractive force, power and energy requirements for standard drive cycles of EV's - motor torque and power rating and battery capacity.

UNIT III CONTROL OF DC AND AC MOTOR DRIVES
9
Speed control for constant torque, constant HP operation of all electric motors - DC/DC chopper based four quadrant operation of DC motor drives, inverter based V/f Operation (motoring and braking) of induction motor drives, vector control operation of Induction motor and PMSM, Brushless DC motor drives, Switched reluctance motor (SRM) drives.

UNIT IV ENERGY STORAGE SYSTEMS
9

UNIT V HYBRID VEHICLE CONTROL STRATEGY
9
HEV supervisory control - Selection of modes - power split mode - parallel mode - engine brake mode - regeneration mode - series parallel mode.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Understand the architecture and dynamics of EVs and HEVs
CO2: Design an EV for standard drive cycle
CO3: Understand the electrical motors' characteristics and its application for vehicle dynamics
CO4: Workout the energy requirements and energy sources for EV application
CO5: Mode of operation and control architecture

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REFERENCES

EE5004 ANALYSIS OF ELECTRICAL MACHINES

OBJECTIVES:

• To understand the fundamentals of magnetic circuits, energy, force and torque of multi-excited systems.
• To analyze the steady state and dynamic state operation of DC machine through mathematical modeling and simulation in digital computer.
• To understand the theory of transformation of three phase variables to two phase variables.
• To analyse the steady state and dynamic state operation of three-phase induction machines using transformation theory based mathematical modeling and digital computer simulation.
• To analyse the steady state and dynamic state operation of three-phase synchronous machines using transformation theory based mathematical modeling and digital computer simulation.

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION
Magnetic circuits, permanent magnet, dynamic induced emf and dynamic torque - stored magnetic energy, co-energy - force and torque in singly and doubly excited systems - machine windings and air gap mmf - determination of winding resistances and inductances – determination of friction coefficient and moment of inertia of electrical machines.

UNIT II DC MACHINES
Elementary DC machine and analysis of steady state operation - Voltage and torque equations – dynamic characteristics of permanent magnet and shunt d.c. motors - electrical and mechanical time constants - Time domain block diagrams -transfer function of d.c. motor responses - digital computer simulation of permanent magnet and shunt d.c. machines.

UNIT III REFERENCE FRAME THEORY
Historical background of Clarke and Park transformations – power invariance and phase transformation and commutator transformation – transformation of variables from stationary to arbitrary reference frame - variables observed from several frames of reference.

UNIT IV INDUCTION MACHINES

UNIT V SYNCHRONOUS MACHINES

TOTAL : 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Understand the magnetic circuits and force components of electrical machines
CO2: Understand the transformation theory and its need for machine modeling
CO3: Acquire and apply the knowledge of machine dynamics in Electrical engineering.
CO4: Model, simulate and analyze the dynamic performance of electrical machines using computational software.
CO5: Formulate, design, simulate power supplies and loads to analyse complete electrical machine performance

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TEXT BOOKS

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EE5005 DESIGN OF ELECTRICAL APPARATUS LT P C 3 0 0 3

OBJECTIVES:
- To provide sound knowledge about constructional details and design of various electrical machines, in order
- To study magnetic circuit parameters and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers
- To design stator and rotor of induction machines and synchronous machines.

UNIT I DESIGN OF FIELD SYSTEM AND ARMATURE 9

UNIT II DESIGN OF TRANSFORMERS 9
Construction - KVA output for single and three phase transformers - Overall dimensions - design of yoke, core and winding for core and shell type transformers – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers. Computer program: Complete Design of single phase core transformer
UNIT III DESIGN OF DC MACHINES
Construction - Output Equations - Main Dimensions - Choice of specific loadings - Selection of number of poles - Design of Armature - Design of commutator and brushes - design of field 
Computer program: Design of Armature main dimensions

UNIT IV DESIGN OF INDUCTION MOTORS

UNIT V DESIGN OF SYNCHRONOUS MACHINES

TOTAL : 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand basics of design considerations for rotating and static electrical machines
CO2: Ability to design single and three phase transformer.
CO3: Ability to design armature and field of DC machines.
CO4: Ability to design stator and rotor of induction motor.
CO5: Ability to design and analyze synchronous machines.

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REFERENCES:
OBJECTIVES:

- To study the concepts behind economic analysis and Load management.
- To analyse the material and energy balance.
- To learn the methods to improve the energy efficiency in thermal utilities.
- To understand the concept of compressed air system and its energy efficiency.
- To emphasize the energy management on various electrical equipments and metering.

UNIT I  GENERAL ASPECTS OF ENERGY MANAGEMENT AND ENERGY AUDIT


UNIT II  MATERIAL AND ENERGY BALANCE

Methods for preparing process flow - material and energy balance diagrams - Energy policy purpose - location of energy management - roles and responsibilities of energy manager – employees training and planning - financial analysis techniques.

UNIT III  ENERGY EFFICIENCY IN THERMAL UTILITIES


UNIT IV  ENERGY EFFICIENCY IN COMPRESSED AIR SYSTEM


UNIT V  ENERGY EFFICIENCY IN ELECTRICAL UTILITIES


TOTAL : 45 PERIODS
COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Students will develop the ability to learn about the need for energy management and auditing process.
CO2: Learners will learn about basic concepts of materials and energy balance.
CO3: Students will understand the energy management in thermal utilities.
CO4: Students will have knowledge on the concepts of compressed air system and its efficiency improvement.
CO5: Students will be able to learn about the concept of lighting systems, light sources and various forms of cogeneration.

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EE5007 FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING LT P C 3 0 0 3

OBJECTIVES:
- To get familiar with the concepts of Object Oriented Programming.
- To have a thorough understanding about Classes and Objects.
- To introduce the concepts related to Object Oriented Programming.
- To have few case studies related to the concepts of Object Oriented Programming.

UNIT I INTRODUCTION
Procedure-Oriented Programming System - Object-Oriented Programming System - Comparison of C++ with C - Object-Oriented Terms and Concepts - Object-Oriented Languages - Differences between Procedural and Object-Oriented Programming - Merits and Demerits of Object-Oriented Programming
Methodology. Structure of a C++ Program - Data Types - Operators in C++ - Control Structures - Functions in C++.

UNIT II CLASSES AND OBJECTS 9
Introduction to Classes and objects - Member Functions and Member Data - Objects and Functions - Objects and Arrays - Name Spaces - Nested Classes - Dynamic Memory Allocation and Deallocation - Constructors and Destructors.

UNIT III INHERITANCE AND POLYMORPHISM 9
Introduction - Base Class and Derived Class Pointers - Function Overriding - Base Class Initialization - Protected Access Specifier - Deriving by Different Accessing specifiers - Different Kinds of Inheritance - Order of Invocation of Constructors and Destructors - Virtual Functions - Mechanism of Virtual Functions - Pure Virtual Functions - Virtual Destructors and Constructors.

UNIT IV OPERATOR OVERLOADING AND TEMPLATES 9
Operator Overloading - Overloading of various Operators - Type Conversion - New Style Casts and the typed Operator - Function Templates - Class Templates - The Standard Template Library (STL).

UNIT V EXCEPTION HANDLING AND CASE STUDIES 9
Introduction - C-Style Handling of Error-generating Code - C++-Style Solution - the try/ throw/ catch Construct - Limitations of Exception Handling. Case Studies: String Manipulations - Building classes for matrix operations

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Develop simple programs using C++
CO2: Develop simple programs in C++ for object oriented concepts
CO3: Develop programs using inheritance and polymorphism
CO4: Overload operators and functions
CO5: Confidence to develop programs for complex problems with error handling

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REFERENCES:
OBJECTIVES:

- To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain through mathematical representation.
- To study various time to frequency domain transformation techniques
- Understand the computation algorithmic steps for Fourier Transform
- To study about filters and their design for digital implementation.
- To introduce the programmable digital signal processor & its application.

UNIT I INTRODUCTION
Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation

UNIT II DISCRETE TIME SYSTEM ANALYSIS
Z-transform and its properties, inverse z-transforms; difference equation - Solution by z-transform, application to discrete systems - Stability analysis, frequency response - Convolution - Introduction to Fourier Transform- Discrete time Fourier transform.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION

UNIT IV DESIGN OF DIGITAL FILTERS
FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows - Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping -Frequency transformation.

UNIT V DIGITAL SIGNAL PROCESSORS
Introduction - Architecture of one DSP processor for motorcontrol - Features - Addressing Formats – Functional modes - Introduction to Commercial Processors

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion the above subject, students will be able to understand
CO1: Ability to understand Signals and systems by their mathematical representation.
CO2: Ability to do system representation using transforms
CO3: Learn the transformation techniques for time to frequency conversion.
CO4: Ability to understand the types of filters and their design for digital implementation.
CO5: Capacity to involve digital signal processor for application development.

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TEXT BOOKS:

REFERENCES:

EE5009 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS LT P C 3 0 0 3

- To study the principle of generation of different renewable energy sources.
- To model the electrical machines used for renewable energy conversion systems.
- To analyse the power converters used for renewable energy systems.
- To analyse the operation of standalone and grid integrated renewable energy systems.
- To study the hybrid operation of wind and PV systems and features of MPPT tracking.

UNIT I INTRODUCTION
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) -Qualitative study of different renewable energy resources: Geothermal, ocean and Biomass.
Wind Energy System- Important terms-TSR, Cp, SRC, Performance Characteristics of Wind turbine-Control System and strategy, Safe operating area.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION
Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III POWER CONVERTERS
Solar: Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing
Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.
UNIT IV  ANALYSIS OF WIND AND PV SYSTEMS 9

Standalone operation of fixed and variable speed wind energy conversion systems - Grid integrated PMSG, SCIG Based WECS, Standalone and grid integrated solar system - Grid connection Issues.

UNIT V  HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems - Range and type of Hybrid systems - Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: Features of different renewable energy sources are studied.

CO2: Features of electrical machines used in renewable energy conversion are studied.

CO3: Various topologies of power converters used for interfacing renewable energy system are studied.

CO4: Wind and PV systems are analysed and its hybrid operation is successfully studied.

CO5: Different MPPT algorithms are studied.

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TEXT BOOKS:


REFERENCES:


EE5010  SPECIAL ELECTRICAL MACHINES  LT P C
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OBJECTIVES:

• To introduce the concepts of permanent magnets and to study the construction, operation, characteristics & control of PMBLDC motor.
• To study construction, operation characteristics and control of PMSM.
• To understand the construction, operation, characteristics, power controllers and control of SRM.
• To study the operation of stepper motor, its types, control and its applications.
• To understand the operation & characteristics of other special machines.
UNIT I PERMANENT MAGNET BRUSHLESS DC MOTORS

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Characteristics and control

UNIT II PERMANENT MAGNET SYNCHRONOUS MOTORS

Principle of operation – EMF and torque equations - Phasor diagram - Power controllers-performance characteristics - Digital controllers - Constructional features, operating principle and characteristics of synchronous reluctance motor.

UNIT III SWITCHED RELUCTANCE MOTORS

Constructional features -Principle of operation- Torque prediction -performance Characteristics-Power controllers - Control of SRM drive- Sensor less operation of SRM - Applications.

UNIT IV STEPPER MOTORS

Constructional features -Principle of operation -Types - Torque equation - Linear and Non-linear analysis - Characteristics - Drive circuits - Closed loop control - Applications.

UNIT V OTHER SPECIAL ELECTRICAL MACHINES

Principle of operation and characteristics of Hysteresis motor - AC series motors - Linear induction motor – Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion the above subject, students will be able to understand

CO1: Analyze given magnetic circuit and understand operation, characteristics and control of PMBLDC motor
CO2: Understand the construction, operation performance characteristics of PMSM and its power controllers.
CO3: Understand the construction, operation and control of SRM drive and its power controllers.
CO4: Understand the construction, operation, characteristics and control of stepper motor
CO5: Understand the operation & characteristics of other special electrical machines.

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TEXT BOOKS:

REFERENCES:


EE5011 FLEXIBLE AC TRANSMISSION SYSTEMS

OBJECTIVES:

To understand:

- The problems in AC transmission systems and establish the Flexible AC transmission systems
- The operation and control of SVC and its applications to enhance the stability and damping.
- The different modes of operation TCSC and to model it for power flow and stability studies.
- The basic operation and control of voltage source converter based FACTS controllers.
- The interaction between the FACTS controllers

UNIT I INTRODUCTION

Reactive power control in electrical power transmission lines-loads & system compensation, Uncompensated transmission line-shunt and series compensation. Basic concepts of Static Var Compensator (SVC)-Thyristor Controlled Series Capacitor (TCSC) -Unified Power Flow Controller (UPFC)

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS


UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS


UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS

UNIT V  CO-ORDINATION OF FACTS CONTROLLERS

Controller interactions - SVC - SVC interaction - Co-ordination of multiple controllers using linear control techniques - Control co-ordination using genetic algorithms.

TOTAL: 45 PERIODS

COURSE OUTCOMES

After completion the above subject, students will be able to understand

CO1: Analyze the problems in AC transmission systems and understand the need for Flexible AC transmission systems
CO2: Analyze the operation and control of SVC and its applications to enhance the stability and damping.
CO3: Analyze the different modes of operation TCSC and to model it for power flow and stability studies.
CO4: Analyze basic operation and control of voltage source converter based FACTS controllers.
CO5: Analyze the interaction between the FACTS controllers

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TEXT BOOKS:


REFERENCES:

To impart knowledge on structure of power system and standard voltage levels
To compute transmission line parameters
To know about HVDC system
To locate various FACTS devices on power system
To study the effect of fields on living and non-living organisms

UNIT I TRANSMISSION LINE TRENDS 9
Standard transmission voltages, average values of line parameters - Power handling capacity and line losses - number of lines, Advantages and disadvantages of HVAC and HVDC system.

UNIT II LINE AND GROUND PARAMETERS 9

UNIT III HVDC SYSTEM 9
HVDC Power transmission- Description, principles of operation and Planning for HVDC transmission- DC breakers- Operating problems- HVDC transmission based on VSC- Types and applications of MTDC systems.

UNIT IV FACTS 9
Basic concepts - Reactive power control, uncompensated transmission line, series compensation, SVC, thyristor control, series capacitor, static synchronous compensator, unified power flow controller and applications.

UNIT V ELECTROSTATIC AND MAGNETIC FIELDS OF EHV LINES 9
Electric shock - threshold currents - Calculation of electrostatic fields and magnetic fields of AC and DC lines - Effect of fields on living organism - Electrical field measurement.

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Ability to identify transmission (HVAC and HVDC) and distribution voltage levels
CO2: Ability to extract transmission line parameters
CO3: Ability to locate required HVDC transmission in power system
CO4: Ability to know the uses of placing FACTS devices
CO5: Able to compute electrostatic and magnetic fields of EHV lines

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REFERENCES:

EE5013 HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

OBJECTIVES:
• To understand the evolution of HVDC Transmission and its applications
• To analyze the operation of HVDC converters
• To understand operation and control of HVDC link
• To investigate the generation of harmonics, reactive power requirement and design suitable filters and FACTS controllers.
• To model AC/DC system and perform load flow analysis of the AC/DC system including the HVDC link.

UNIT I INTRODUCTION
DC Power transmission technology-Comparison of AC and DC transmission-Application of DC transmission-Description of HVDC transmission system-Planning for HVDC transmission-Modern trends in HVDC technology-DC breakers-Operating problems- HVDC transmission based on VSC – Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS
Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number-Choice of converter configuration - Converter bridge characteristics-Analysis of a 12 pulse converters- Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL
Principles of DC link control-Converter control characteristics-System control hierarchy- Firing angle control- Current and extinction angle control-Starting and stopping of DC link -Power control -Higher level controllers -Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL
Reactive power requirements in steady state-Sources of reactive power-SVC and STATCOM-Generation of harmonics -Design of AC and DC filters- Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS
Per unit system for DC quantities-DC system model -Inclusion of constraints -Power flow analysis – case study

TOTAL: 45 PERIODS

108
COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: understand the need for HVDC transmission and its evolution
CO2: analyze the operation of the converters
CO3: to understand the different modes of operation HVDC link and mode shaping
CO4: design filters to eliminate AC/DC harmonics and provide support to reactive power support by means of FACTS.
CO5: Perform AC/DC load flow by including HVDC link.

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EE5014 FUNDAMENTALS OF COMPUTER ARCHITECTURE

OBJECTIVES:
- To discuss the number system basics and computer arithmetic.
- To study the concepts related to memory organization.
- To learn digital logic, combinational and sequential circuits.
- To explain different types of addressing modes and memory organization.
- To familiarize with parallelism and pipelining.

UNIT I COMPUTER ARITHMETIC AND LOGIC

UNIT II MEMORIES
Memory and storage - Physical memory and physical addressing - Caches and caching - Virtual memory technologies and virtual addressing.
UNIT III  INPUT AND OUTPUT

UNIT IV  CENTRAL PROCESSING UNIT
Instruction sets: Machine instruction characteristics - Types of operands - Intel x86 and ARM data types - Types of operations - Intel x86 and ARm operation types - Addressing modes - x86 and ARM addressing modes - Instruction formats - x86 and ARM instruction formats. Processor structure and function: Processor organization - Register organization - Instruction cycle.

UNIT V  PARALLELISM AND DATA PIPELINING
Parallelism: Introduction - Parallel and Pipelined Architectures - Characterizations Of Parallelism – Types of parallelism and parallel architectures (Flynn classification) - Communication, Coordination, And Contention - Performance Of Multiprocessors - Consequences For Programmers - Redundant Parallel Architectures - Distributed And Cluster Computers. Data Pipelining: The concept of pipelining - Software pipelining - Software pipelining and Hardware pipelining.

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand

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<td>Design and evaluate combinational and sequential logic circuits with multiple inputs and outputs</td>
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<td>Explain the architecture and functionality of central processing unit</td>
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REFERENCES:
OBJECTIVES:

- To achieve an understanding of fundamental data structures and algorithms and the tradeoffs between different implementations of these abstractions
- To explain theoretical analysis, implementation, and application.
- To understand the concepts related to non-linear data structures like trees and graphs
- To learn the basics of Array processing, Sorting and Searching
- To design new algorithms or modify existing ones for new applications

UNIT I  INTRUDUCTION AND BASIC DATA STRUCTURES  9
Problem Solving Techniques with Examples- Introduction to Abstract Data Types (ADT) - Elementary Data Structures: Stacks and queues and their implementation - Linked lists - Implementing pointers and objects.

UNIT II  ADVANCED DATA STRUCTURES  9

UNIT III  SORTING AND HASING  9

UNIT IV  ALGORITHM DESIGN TECHNIQUES  9

UNIT V  GRAPH ALGORITHMS  9

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: A comprehensive understanding of fundamentals data structures
CO2: Implement and compare the fundamental data structures
CO3: Develop programs on their own for advanced data structures
CO4: Correlate the use of data structures in real life situations
CO5: Confidence to develop programs for complex problems with improved performance
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**TEXT BOOKS:**

2. R G Dromey, "How to solve it by computers”, 9th Impression, Pearson Education Asia, 2011.

**REFERENCES:**


**EE5016 ROBOTICS AND AUTOMATION**

**OBJECTIVES:**

- To introduce basic robotic terminologies
- To illustrate various parts of robots
- To introduce manipulator dynamics and gripper types.
- To illustrate kinematics and path planning.
- To introduce dynamics and control operation.

**UNIT I BASIC CONCEPTS**

Definition and origin of robotics - different types of robotics - various generations of robots - degrees of freedom - Robot classifications and specifications- Asimov's laws of robotics - dynamic stabilization of robots.

**UNIT II POWER SOURCES, SENSORS AND ACTUATORS**

Hydraulic, pneumatic and electric drives: Design and control issues - determination of HP of motor and gearing ratio - variable speed arrangements - path determination - micro machines in robotics - machine vision - ranging - laser - acoustic - magnetic, fiber optic and tactile sensors.

**UNIT III MANIPULATORS AND GRIPPERS DIFFERENTIAL MOTION**

Construction of manipulators - manipulator dynamics and force control - electronic and pneumatic manipulator control circuits - end effectors - U various types of grippers - design considerations.
UNIT IV KINEMATICS AND PATH PLANNING  
Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints-Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance Solution kinematics problem – robot programming languages

UNIT V DYNAMICS AND CONTROL AND APPLICATIONS  

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: Understand the evolution of robot technology and mathematically represent different types of robot.
CO2: Get exposed to the case studies and design of robot machine interface.
CO3: Understand manipulator and gripper operation
CO4: Develop kinematic and path planning equations for standard configurations
CO5: Familiarize various control schemes of Robotics control

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REFERENCES:
OBJECTIVES:
- To understand the basics of electromechanical energy conversion.
- To design an electrical machine.
- To impact knowledge on problem formulation for field computation.
- To analyse the performance parameters for rotating machines.
- To analyse the performance parameters for linear machines.

UNIT I INTRODUCTION
Review on electromagnetic theory – Basic field equations, calculation of field distribution, inductance, capacitance, force and torque, energy, Laplace/poisson equations, electromechanical energy conversion for linear and rotating actuators, Difference in torque equations for cylindrical and salient pole machines.

UNIT II REVIEW ON CONVENTIONAL ELECTRICAL MACHINE DESIGN
Introduction to Electrical design methods, Design Specifications, Output Equations of AC & DC Machines; Importance of specific loadings; Electrical and Magnetic Materials, Types, Linear and Non-linear Material, Standards of Electrical machines design, Heat dissipation and Cooling methods, Ventilation schemes in static (Transformers) and rotating machines; Types of enclosures; Step by Step General design procedure to reach optimal design, Limitations of conventional methods, Need for computer aided design, Advantages.

UNIT III FINITE ELEMENT ANALYSIS
Introduction to FEM, Boundary value Problems, Boundary Conditions, formulation for 2-D planar and axial symmetry problems- governing equations, discretization, element shape functions, global matrices/vectors, solution, post processing.

UNIT IV FE ANALYSIS OF ROTATING ACTUATORS (MACHINES) (PRACTICAL)
Modelling and Analysis of DC machines, Induction Machines, Synchronous Machines and Reluctance machines. Types of Analysis-Static, Time harmonic and transient with motion conditions, Prediction of performance parameters.

UNIT V FE ANALYSIS OF LINEAR ACTUATORS (PRACTICAL)
Modelling and Analysis of Solenoid Actuators, Linear Induction Motor, Linear PMSM, Linear SRM and Transformers. Types of Analysis-Static, Time harmonic and transient with motion conditions, Prediction of performance parameters.

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Understand the basics of electromechanical energy conversion.
CO2: Design an conventional electrical machine using finite element package.
CO3: Define boundary conditions and formulate the equations for FEA.
CO4: Enhance the performance parameters using FEA of rotating machines.
CO5: Enhance the performance parameters using FEA of linear machines.

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EE5018 SMART GRID LT P C 3 0 0 3

OBJECTIVES:
- To understand the evolution of Smart and Interconnected energy systems.
- To understand the various challenges and benefits of smart grid and the national and international initiatives taken.
- To understand the concepts related with transmission and distribution in smart grid technologies.
- To get an insight of the various smart measurement technologies.
- To understand the various computing technologies for Smart Operation of the Grid.

UNIT I INTRODUCTION 9
Evolution of Energy Systems, Concept, Definitions and Need, Difference between Conventional & Smart Grid, Drivers, structures, functions, opportunities, challenges and benefits of Smart Grid, Basics of Microgrid, National and International Initiatives in Smart Grid.

UNIT II SMART METERING 9
Introduction to Advanced Metering infrastructure (AMI) - drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Real time management and control, Phasor Measurement Unit (PMU).

UNIT III SMART GRID TECHNOLOGIES (Transmission) 9
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, Wide area Monitoring, Protection and control.
UNIT IV SMART GRID TECHNOLOGIES (Distribution)  9
DMS, Volt/VAr control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Electric Vehicles.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS  9
Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Computing technologies for Smart Grid applications (Web Service to CLOUD Computing), Role of big data and IoT, Cyber Security for Smart Grid.

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: To be able to understand the importance and objectives of Power System Grid.
CO2: To be able to know and understand the concept of a smart grid;
CO3: To identify and discuss smart metering devices and associated technologies.
CO4: To be able to get an overview of Microgrid and Electric Vehicle Technology.
CO5: To be able to have an up to date knowledge on the various computing technologies; to understand the role of Big Data and IoT for effective and efficient operation of Smart Grid.

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the restructuring of power industry and market models
- To impart knowledge on fundamental concepts of congestion management
- To analyze the concepts of locational marginal pricing and financial transmission rights
- To gain insight on the ancillary service management and pricing of transmission network
- To illustrate about the electricity act and various power reforms in India

UNIT I INTRODUCTION TO RESTRUCTURING OF POWER INDUSTRY
Introduction: Deregulation of power industry, Restructuring process, Issues involved in deregulation, Deregulation of various power systems-Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production- Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis-a-vis other commodities, Market architecture, Case study.

UNIT II TRANSMISSION CONGESTION MANAGEMENT

UNIT III LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHT

UNIT IV ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK
Introduction of ancillary services-Types of Ancillary services Classification of Ancillary services-Load generation balancing related services Voltage control and reactive power support devices-Black start capability service-How to obtain ancillary service-Co-optimization of energy and reserve services-International comparison Transmission pricing -Principles- Classification- Rolled in transmission pricing methods-Marginal transmission pricing paradigm-Composite pricing paradigm-Merits and demerits of different paradigm.

UNIT V REFORMS IN INDIAN POWER SECTOR
Introduction-Frame work of Indian power sector-Reform initiatives-Availability based tariff Electricity act 2003-Open access issues-Power exchange-Reforms in the near future

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: To be able to gain knowledge on the fundamentals of deregulation of power systems
CO2: To understand the basics and classification of transmission congestion management
CO3: To learn about the fundamental concepts involved in locational margin prices and financial transmission rights
OBJECTIVES:

• To impart knowledge on Motor Starting Studies.
• To understand the need for power factor correction and analyse the various methods that are used in the Power Factor Correction studies.
• To learn about the sources of harmonics, evaluate the harmonics present in the power system and mitigate them by filters.
• To analyse the sources that can cause the voltage flicker and find solutions to minimize the flicker.
• To impart knowledge on the ground grid analysis.

UNIT I MOTOR STARTING STUDIES


UNIT II POWER FACTOR CORRECTION STUDIES


UNIT III HARMONIC ANALYSIS


UNIT IV FLICKER ANALYSIS
UNIT V GROUND GRID ANALYSIS


TOTAL: 45 PERIODS

COURSE OUTCOMES

After completion the above subject, students will be able to understand
CO1: perform motor starting studies.
CO2: To model and carry out power factor correction studies.
CO3: Perform harmonic analysis and reduce the harmonics by using filters.
CO4: Carry out the flicker analysis by proper modeling of the load and its minimization.
CO5: Design the appropriate ground grid for electrical safety.

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TEXT BOOKS:

REFERENCES:

EE5021 VLSI DESIGN AND ARCHITECTURE LT P C 3 0 0 3

OBJECTIVES:
• To understand the basic concepts of VLSI and CMOS design.
• To introduce the basics of VLSI design and its importance.
• To study the combinational and sequential CMOS circuit design.
• To introduce the IC fabrication methods
• To learn about the programming of Programmable device using Hardware description Language.

UNIT I MOS TRANSISTOR &CMOS:

Introduction to logic design- switching devices- MOS transistor current equation-characteristics-
Scaling- MOS Transistor Model- NMOS & CMOS inverter -characteristics Determination of pull up / pull down ratios, Nano MOSFET.

UNIT II CMOS CIRCUIT DESIGN: 9
CMOS based combinational logic design- Dynamic CMOS & clocking -Transmission Gates- BiCMOS-CMOS memory circuits.

UNIT III IC FABRICATION : 9
Fabrication Technologies (NMOS, PMOS, CMOS, BiCMOS)- Stick Diagrams, Design Rules and Layout - recent trends in IC fabrication.

UNIT IV PROGRAMMABLE LOGIC DEVICES: 9
PLA, PAL, GAL, CPLD, FPGA and FPAA– Implementation of Finite State Machine with PLDs.

UNIT V VHDL PROGRAMMING: 9

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Understanding the role of MOSFET for computation.
CO2: The learning process delivers insight into developing CMOS design techniques
CO3: Insight into IC fabrication methods.
CO4: Improved skill set in programmable logic devices usage for applications.
CO5: Understanding and usage of HDL computational processes with improved design strategies.

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To Learn and understand the concepts of operating system and services.
- To demystify the core structure, functions and design principles of operating system.
- To familiarize with the issues involved in the design and implementation of modern operating systems
- To introduce the implementation of these concepts in Linux and Windows

UNIT I OPERATING SYSTEM OVERVIEW AND PROCESSES


UNIT II PROCESS MANAGEMENT AND SYNCHRONIZATION


UNIT III MEMORY AND STORAGE MANAGEMENT


UNIT IV FILE SYSTEM, SECURITY AND PROTECTION


UNIT V CASE STUDIES


TOTAL : 45 PERIODS
COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: A thorough understanding of OS concepts and its services
CO2: Clear idea about the process, memory and storage management
CO3: Various file system concepts and their implementation
CO4: A complete knowledge of file system security and protection
CO5: How these concepts are implemented in Windows and Linux

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EE5023 EMBEDDED SYSTEM AUTOMATION LT P C
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OBJECTIVES:
• To introduce the Significance and the role of embedded system for automation.
• To understand the embedded system role in IOT and use it for application development.
• To observe the need for smart cities and systems
• To introduce the automotive embedded systems
• To observe the evolving trend in communication based automotive systems.

UNIT I EMBEDDED SYSTEMS DESIGN 9

UNIT II EMBEDDED SYSTEM FOR IOT 9
UNIT III  EMBEDDED SYSTEMS AND IOT APPLICATIONS  9
Embedded system for Smart Meter- smart Grid -Smart cities and smart homes, Agriculture and Healthcare, Energy auditing.

UNIT IV  EMBEDDED SYSTEM FOR AUTOMOTIVE SYSTEM  9
Electronic control Unit - Vehicle Management Systems- Sensors-Actuators-Vehicle Communication protocols -Infotronics- Introduction to AUTO SAR.

UNIT V  ADVANCES IN AUTOMOTIVE ELECTRONIC SYSTEMS  9

TOTAL 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Ability to understand hardware and software requirements in embedded systems.
CO2: Ability to do develop data management through cloud interface with processor technology
CO3: Learn the development smart system solutions and analyse issues.
CO4: Ability to understand the types of sensors and Bus for control implementation.
CO5: Capacity to involve communication concepts for vehicle application development.

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:

• To understand the various power quality issues.
• To understand the concept of power and power factor in single phase and three phase systems supplying nonlinear loads.
• To understand the conventional compensation techniques used for power factor correction and load voltage regulation.
• To understand the active compensation techniques used for power factor correction.
• To understand the active compensation techniques used for load voltage regulation.

UNIT I INTRODUCTION
Introduction – Characterisation of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

UNIT II ANALYSIS OF SINGLE PHASE AND THREE PHASE SYSTEM

UNIT III CONVENTIONAL LOAD COMPENSATION METHODS

UNIT IV LOAD COMPENSATION USING DSTATCOM
Compensating single - phase loads - Ideal three phase shunt compensator structure - generating reference currents using instantaneous PQ theory - Instantaneous symmetrical components theory - Generating reference currents when the source is unbalanced - Realization and control of DSTATCOM – DSTATCOM in Voltage control mode.

UNIT V SERIES COMPENSATION OF POWER DISTRIBUTION SYSTEM
Rectifier supported DVR - Dc Capacitor supported DVR - DVR Structure - voltage Restoration - Series Active Filter - Unified power quality conditioner.

TOTAL : 45 PERIODS
COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: Able to classify power quality disturbances, their causes, detrimental effects and knowledge about national and international Power quality standards

CO2: Ability to assess the impact of harmonics in single phase and three phase distribution systems

CO3: Capability to adopt passive harmonic mitigation techniques for load compensation and voltage regulation.

CO4: Able to employ dynamic harmonic current compensation methods in distribution systems

CO5: Able to employ dynamic voltage regulation methods in distribution systems

Describe the causes and effects of power quality problems and categorize the various electrical power quality issues in a distribution system

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TEXT BOOKS:

EE5025 ADVANCED CONTROL SYSTEM LT P C

OBJECTIVES:
- To illustrate state feedback control and state observer.
- To illustrate phase plane analysis.
- To illustrate describing function analysis.
- To illustrate the design of optimal controller.
- To illustrate the design of optimal estimator including Kalman Filter

UNIT I STATE VARIABLE DESIGN 9
Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design - Design of state observers- Separation principle- Design of servo systems: State feedback with integral control

UNIT II PHASE PLANE ANALYSIS 9
UNIT III  DESCRIPTING FUNCTION ANALYSIS  9

UNIT IV  OPTIMAL CONTROL  9

UNIT V  OPTIMAL ESTIMATION  9

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Design state feedback controller and state observer.
CO2: Analyse linear and nonlinear systems using phase plane method.
CO3: Analyse nonlinear systems using describing function method.
CO4: Design optimal controller.
CO5: Design optimal estimator including Kalman Filter.

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- Get familiarized with different architectures and training algorithms of neural networks.
- Get exposed to the various neural modeling and control techniques with case study using simulation tool box.
- Gain Knowledge on fuzzy set theory and fuzzy rules.
- Able to design and implement the fuzzy logic controller with case study using simulation tool box.
- Capable of designing hybrid control schemes, selected optimization algorithms with case study using simulation tool box.

UNIT I  ARTIFICIAL NEURAL NETWORK  9
Review of fundamentals - Biological neuron, artificial neuron, activation function, single layer perceptron - Limitation - Multi layer perceptron - Back propagation algorithm (BPA) - Recurrent neural network (RNN) - Adaptive resonance theory (ART) based network - Radial basis function network - online learning algorithms, BP through time - RTRL algorithms - Reinforcement learning.

UNIT II  NEURAL NETWORKS FOR MODELING AND CONTROL  9
Modelling of non-linear systems using ANN - Generation of training data - Optimal architecture-Model validation - Control of non-linear systems using ANN - Direct and indirect neuro control schemes - Adaptive neuro controller - Familiarization with neural network toolbox

UNIT III  FUZZY SET THEORY  9
Fuzzy set theory - Fuzzy sets - Operation on fuzzy sets - Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation - Fuzzy membership functions

UNIT IV  FUZZY LOGIC FOR MODELING AND CONTROL  9
Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification - Knowledge base - Decision making logic - Defuzzification - Adaptive fuzzy systems - Familiarization with fuzzy logic toolbox

UNIT V  HYBRID CONTROL SCHEMES  9
Fuzzification and rule base using ANN - Neuro fuzzy systems - ANFIS - Fuzzy neuron- Introduction to GA - Optimization of membership function and rule base using Genetic Algorithm - Introduction to support vector machine - Particle swarm optimization - Case study - Familiarization with ANFIS toolbox

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: Be able to study the overview of artificial neural network and training algorithms.
CO2: Be able to analyze problems to formulate models and develop control schemes using Neuro controller systems
CO3: Be able to design fuzzy controller for non-linear systems
CO4: Be able to apply engineering fundamentals to use hybrid schemes and optimization algorithms to obtain solution for complex engineering problems.
CO5: Be capable of using modern IT tool boxes to simulate case studies
TEXT BOOKS:


REFERENCES:


EE5027 INDUSTRIAL DATA COMMUNICATION LT P C 3 0 0 3

OBJECTIVES:

- To give an overview of Industrial data communications systems.
- To provide a fundamental understanding of principles, standards, protocols.
- To impart knowledge on industrial networks and Field buses
- To impart the fundamental understanding on SCADA systems.
- To provide insight into some of the new principles those are evolving for future networks.

UNIT I DATA COMMUNICATION CONCEPTS AND MODELS 9


UNIT II SERIAL COMMUNICATION STANDARDS AND LOCAL AREA NETWORKS 9


UNIT III NETWORK SOFTWARE, INDUSTRIAL NETWORKS AND FIELD BUSES 9

UNIT IV  SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEMS  
Wide-Area Communications - Modbus RTU Protocol - Communications Security – SCADA 
Applications: Power Generating Stations - Power Distribution System - Remote Industrial Plant, 
Wireless SCADA.

UNIT V  WIRELESS COMMUNICATION  
Wireless sensor networks: Hardware components - energy consumption of sensor nodes - Network 
architecture - sensor network scenario. Wireless HART - Existing Wireless Options: IEEE 802.15.4 - 
ISA 100 - Zigbee - Bluetooth - their relevance to industrial applications.

TOTAL : 45 PERIODS

COURSE OUTCOMES 
After completion the above subject, students will be able to understand
CO1: Ability to understand the concepts of various industrial data communication networks, 
protocols and their selection.
CO2: To be able to select and use most appropriate networking technologies and standards for a 
given application.
CO3: To be able to design and ensure that the best practice is followed in installing and 
commissioning the data communications links.
CO4: To be able to understand the concepts of SCADA Systems and its applications
CO5: To be able to understand requirements of industrial application and provide wired or wireless 
solution.

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TEXT BOOKS: 
1. Lawrence M. Thompson and Tim Shaw, "Industrial Data Communications", Fifth Edition, ISA Press, 
   2015
2. Mackay, S., Wright,E., Reynders,D., and Park,J., “Practical Industrial Data Networks: Design, 

REFERENCES: 
   2004.
OBJECTIVES:

• To Introduce Fundamentals of Biomedical Engineering
• To study the communication mechanics in a biomedical system with few examples
• To study measurement of certain important electrical and non-electrical parameters
• To understand the basic principles in imaging techniques
• To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES
Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood -measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

UNIT IV IMAGING MODALITIES AND ANALYSIS
Radio graphic and fluoroscopic techniques - Computer tomography - MRI - Ultrasonography-Endoscopy – Thermography -Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES

TOTAL : 45 PERIODS
COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Able to understand the fundamental art of biomedical engineering.
CO2: Able to understand the non-electrical parameters measurement and diagnostic
procedures
CO3: Able to understand the concept of bio medical data acquisition and the working of EEG, ECG etc..
CO4: Able to understand about imaging modalities and analysis through computer tomography.
CO5: Able to understand the life assisting, therapeutic and robotic devices and their technical
applications.

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REFERENCES:

EE5029 ADAPTIVE CONTROL SYSTEM LT P C
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OBJECTIVES:
To introduce adaptive control.
- To introduce the need for and effects of adaptive control
- To illustrate study the parameter identification of systems.
- To illustrate the self-tuning of PID controllers based on parameter identification.
- To illustrate the model reference adaptive control.
- To introduce practical application through case studies.

UNIT I INTRODUCTION
UNIT II PARAMETRIC IDENTIFICATION
Linear in parameter models - ARX - ARMAX - ARIMAX - Least square estimation - Recursive least square estimation - Extended least square estimation - Maximum likelihood estimation - Introduction to non-linear systems identification - Pseudo random binary sequence.

UNIT III SELF-TUNING REGULATOR

UNIT IV MODEL REFERENCE ADAPTIVE CONTROLLER

UNIT V TUNING OF CONTROLLERS AND CASE STUDIES

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Understand the effect of parameter variation and principle of adaptive control schemes.
CO2: Distinguish different parametric identification methods.
CO3: Understand Deterministic and Stochastic Self Tuning Regulators.
CO4: Design of model reference adaptive controller
CO5: Design gain scheduling controller and apply adaptive control schemes for industrial processes.

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To know various electric drives and traction motors with applications
- To introduce the energy saving concept by different ways of illumination.
- To understand the different methods of electric heating and electric welding.
- To know how to utilize the solar radiation into electrical energy for different applications
- To study basic principles of wind energy conversion

UNIT I  ELECTRIC DRIVES AND TRACTION  9
Fundamentals of electric drive - choice of an electric motor - application of motors for particular services traction generator set, traction motors, power transformers - characteristic features of traction motor - systems of railway electrification - electric braking - train movement and energy consumption - traction motor control - track equipment and collection gear.

UNIT II  ILLUMINATION  9
Introduction - definition and meaning of terms used in illumination engineering - classification of light sources - incandescent lamps, sodium vapour lamps, mercury vapour lamps, fluorescent lamps – design of illumination systems - indoor lighting schemes - factory lighting halls - outdoor lighting schemes - flood lighting - street lighting - UPS- energy saving lamps, LED - working principle of air conditioning system

UNIT III  HEATING AND WELDING  9

UNIT IV  SOLAR RADIATION AND SOLAR ENERGY COLLECTORS  9

UNIT V  WIND ENERGY  9
Introduction - basic principles of wind energy conversion - site selection considerations - basic components of a WECS (Wind Energy Conversion System) - Classification of WECS - types of wind machines - analysis of aerodynamic forces acting on the blade - performances of wind.

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Ability to choose suitable electric drives for different applications
CO2: Ability to design the illumination systems for energy saving
CO3: Ability to understand the utilization of electrical energy for heating and welding purposes
CO4: Ability to know the effective usage of solar energy for electrical applications
CO5: Able to locate the wind farm for generating electrical energy
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**TEXT BOOKS:**

**REFERENCES:**

EE5031 MICRO ELECTRO MECHANICAL SYSTEMS LT P C 3 0 0 3

**OBJECTIVES:**
- To introduce MEMS technology
- To study the different MEMS materials and their properties
- To study the different fabrication process used in MEMS technology.
- To introduce the fundamental working principles of different micro sensors and actuators.
- To provide insight on application areas of MEMS technology

**UNIT I INTRODUCTION**
9
Intrinsic Characteristics of Micro systems - Macro and micro Sensors and Actuators -Scaling laws - Silicon and polymer based MEMS processes and MEMS Materials

**UNIT II MICROMACHINING**
9
Bulk Micromachining - Surface micromachining, LIGA processes and Polymer MEMS fabrication process.

**UNIT III SENSORS AND ACTUATORS - I**
9
Electrostatic sensors - Parallel plate capacitors - Applications - Micro motors - Inter digitated Finger capacitor - Comb drive devices - Thermal Sensing and Actuation - Thermal expansion- Thermal couples - Thermal resistors - Applications - Microfluidics for sensing and actuation applications.

**UNIT IV SENSORS AND ACTUATORS - II**
9
UNIT V  APPLICATIONS


TOTAL : 45 PERIODS

COURSE OUTCOMES

After completion the above subject, students will be able to understand

CO1: Understanding the material properties and the significance of MEMS.
CO2: Knowledge delivery on micromachining and micro fabrication.
CO3: Applying the concepts of MEMS to design the sensors and actuators.
CO4: Applying the fabrication mechanism for MEMS sensor and actuators.
CO5: Able to identify the right MEMS device against the applications.

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TEXT BOOKS


REFERENCES:


EE5032  ENERGY AUDITING  LT P C  3 0 0 3

OBJECTIVES:

• To understand the current energy scenario and importance of energy conservation.
• To get familiarization with the measuring instruments used for the energy auditing.
• To emphasize the need for energy audit on various electrical systems.
• To determine the methods of energy audit for the various industrial systems.
• To illustrate the concepts of different energy efficient devices.

UNIT I  GENERAL ASPECTS OF ENERGY AUDIT

Commercial and Non-commercial energy - energy needs of growing economy - energy pricing - energy sector reforms - energy conservation and its importance - Re-structuring of the energy supply sector - Energy Conservation Act-2001 and its features - electricity tariff - Demand Side
Management – Energy Audit - Need for Energy Audit - Energy audit Methodology – understanding energy costs

UNIT II INSTRUMENTS FOR ENERGY AUDITING 9

Energy Audit Instruments - classification - basic precautions - Need for instruments- Types - ultrasonic non-contact type flow meters for liquids - Clamp-on type power/energy meters - Anemometers/Pitot tube for measuring velocity of gas - Digital Manometer - Tachometer - Digital Thermometers for liquid/surface temperature - Pyrometer - Thermal Imagers - Lux Meter - Combustion Gas Analyzer - Pressure Gauges - Digital Hydro-temperature meter for temperature and RH measurement

UNIT III ENERGY EFFICIENCY IN ELECTRICAL SYSTEMS 9

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors – case study

UNIT IV ENERGY EFFICIENCY IN INDUSTRIAL SYSTEMS 9

Compressed Air System: Types of air compressors - compressor efficiency, efficient compressor operation, compressed air system components - Factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, Performance Evaluation, energy conservation opportunities, Pumps and Pumping System: Types, Performance Evaluation, energy conservation opportunities – case study

UNIT V ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS 9


TOTAL: 45 PERIODS

COURSE OUTCOMES

After completion the above subject, students will be able to understand

CO1: Develop the ability to learn about the need for energy auditing process and usage of energy audit equipment.

CO2: Students will learn about the basic concepts of economic analysis and understand the energy management techniques

CO3: Learn the fundamental concepts and energy saving potentials for various electrical equipment

CO4: Develop the skills to learn and understand the energy efficient tools for industrial systems

CO5: Students will be able to learn about the concepts of energy efficiency in electrical utilities
TEXT BOOKS:


REFERENCES:


Success Stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

EE5033 NANO TECHNOLOGY LT P C
3 0 0 3

OBJECTIVES:

- To introduce the concept and knowledge of Nano science and Nanotechnology.
- To create awareness of clean room environment & societal implications of Nanotechnology.
- To know about preparation methods and nanofabrication techniques.
- To know about the different characterization techniques used for Nano systems.
- To understand the significant applications of nanotechnology.

UNIT I INTRODUCTION: 9
Overview of Nano scale Science and Technology- Implications on Science, Engineering and society -nano structured materials- Properties- Nanotoxicology-Clean room standards.

UNIT II PREPARATION ROUTES: 9
Preparation of nanoscale materials: precipitation, mechanical milling, colloidal routes, self assembly; vapour phase deposition, CVDs, sputtering, evaporation, molecular beam epitaxy, atomic layer epitaxy.
UNIT III LITHOGRAPHY FOR NANOSCALE DEVICES: 9
Lithography process, optical/UV, electron beam, Ion Beam and x-ray lithography, Nano imprint technique - Scanning probe lithography.

UNIT IV CHARACTERIZATION TECHNIQUES: 9
X-ray and Neutron diffraction technique, Scanning Electron Microscopy plus environmental techniques, Transmission Electron Microscopy including high-resolution imaging, analytical electron microscopy, EDX and EELS, Surface Analysis techniques, XPS, SIMS, Auger.

UNIT V EVOLVING INTERFACES OF NANO: 9

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: Students will be able to understand the significance and implication of nanotechnology
CO2: To be able to apply the concept of nanotechnology for Electrical and Electronics Engineering Applications.
CO3: Familiar with Rules and guidelines of clean room standards
CO4: Understanding the Fabrication methods and characterization techniques
CO5: Students will be able to know the recent trends of nanotechnology

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TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I INTRODUCTION

History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES


UNIT III ORGANS OF GOVERNANCE

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions

UNIT IV EMERGENCY PROVISIONS


UNIT V LOCAL ADMINISTRATION

District’s Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila Pachayat- Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy

COURSE OUTCOMES

After completion the above subject, students will be able to understand

CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.
TEXT BOOKS:

AD5092 VALUE EDUCATION

OBJECTIVES:
- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self destructive habits with value education
- Interpret social empowerment with value education

UNIT I INTRODUCTION TO VALUE EDUCATION
Values and self-development - Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non-moral valuation, Standards and principles, Value judgements

UNIT II IMPORTANCE OF VALUES
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III INFLUENCE OF VALUE EDUCATION
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV REINCARNATION THROUGH VALUE EDUCATION

UNIT V VALUE EDUCATION IN SOCIAL EMPOWERMENT
Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Completion effectively

TOTAL: 45 PERIODS
COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Gain knowledge of self-development
CO2: Learn the importance of Human values
CO3: Develop the overall personality through value education
CO4: Overcome the self destructive habits with value education
CO5: Interpret social empowerment with value education

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REFERENCES:

AD5093  PEDAGOGY STUDIES  LT P C
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OBJECTIVES:

- Understand the methodology of pedagogy.
- Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
- Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
- Illustrate the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

UNIT I INTRODUCTION AND METHODOLOGY:
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.
UNIT IV PROFESSIONAL DEVELOPMENT

Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS

Research design - Contexts - Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 45 PERIODS

COURSE OUTCOMES

After completion the above subject, students will be able to understand

CO1: Understand the methodology of pedagogy.

CO2: Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.

CO3: Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

CO4: Know the factors necessary for professional development.

CO5: Identify the Research gaps in pedagogy.

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OBJECTIVES:

- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do’s and Don’t’s in life through Yam
- Categorize Do’s and Don’t’s in life through Niyam
- Develop a healthy mind and body through YogAsans
- Invent breathing techniques through Pranayam

UNIT I INTRODUCTION TO YOGA
Definitions of Eight parts of yog. (Ashtanga)

UNIT II YAM
Do’s and Don’t’s in life.
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III NIYAM
Do’s and Don’t’s in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT IV ASAN
Various yog poses and their benefits for mind & body

UNIT V PRANAYAM
Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2: Learn Do’s and Don’t’s in life through Yam
CO3: Learn Do’s and Don’t’s in life through Niyam
CO4: Develop a healthy mind and body through YogAsans
CO5: Learn breathing techniques through Pranayam

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1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur
OBJECTIVES:
   a. Develop basic personality skills holistically
   b. Develop deep personality skills holistically to achieve happy goals
   c. Rewrite the responsibilities
   d. Reframe a person with stable mind, pleasing personality and determination
   e. Discover wisdom in students

UNIT I  NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I  9
Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) - Verses- 26,28,63,65 (virtue)

UNIT II  NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II  9
Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's)

UNIT III  APPROACH TO DAY TO DAY WORK AND DUTIES  9
Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-
Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48

UNIT IV  STATEMENTS OF BASIC KNOWLEDGE – I  9
Statements of basic knowledge - Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 Chapter 12 -
Verses 13, 14, 15, 16,17, 18

UNIT V  PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA  9
Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 - Verses
37,38,63

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

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   1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari’sThreeSatakam , Niti-sringar-
vairagya, New Delhi,2010
   2. Swami Swarupananda , Srimad Bhagavad Gita, AdvaitaAshram,Publication Department,
Kolkata,2016

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COURSE OBJECTIVES
The course will introduce the students to
- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

UNIT I  INTRODUCTION TO CULTURE  9
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II INDIAN LANGUAGES AND LITERATURE  9
Indian Languages and Literature - I: Languages and Literature of South India, - Indian Languages and Literature - II: Northern Indian Languages & Literature

UNIT III RELIGION AND PHILOSOPHY  9
Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)

UNIT IV FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING)  9
Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V EDUCATION SYSTEM IN INDIA  9
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TOTAL: 45PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Understand philosophy of Indian culture.
CO2: Distinguish the Indian languages and literature.
CO3: Learn the philosophy of ancient, medieval and modern India.
CO4: Acquire the information about the fine arts in India.
CO5: Know the contribution of scientists of different eras.
CO6: Understand education systems in India

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5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989

AD5098 SANGA TAMIL LITERATURE APPRECIATION L T P C 3 0 0 0

Course Objectives: The main learning objective of this course is to make the students an appreciation for:
1. Introduction to Sanga Tamil Literature.
2. ‘Agathinai’ and ‘Purathinai’ in Sanga Tamil Literature.
3. ‘Attruppadai’ in Sanga Tamil Literature.
4. ‘Puranaanuru’ in Sanga Tamil Literature.
5. ‘Pathitrupaththu’ in Sanga Tamil Literature.

UNIT I SANGA TAMIL LITERATURE AN INTRODUCTION
Introduction to Tamil Sangam-History of Tamil Three Sangams-Introduction to Tamil Sangam Literature-Special Branches in Tamil Sangam Literature- Tamil Sangam Literature’s Grammar-Tamil Sangam Literature’s parables.

UNIT II ‘AGATHINAI’ AND ‘PURATHINAI’
Tholkappiyar’s Meaningful Verses-Three literature materials-Agathinai’s message- History of Culture from Agathinai- Purathinai-Classification-Message to Society from Purathinai.

UNIT III ‘ATTRUPPADAI’

UNIT IV ‘PURANAANURU’
Puranaanuru on Good Administration, Ruler and Subjects-Emotion & its Effect in Puranaanuru.

UNIT V ‘PATHITRUPATHTHU’
Pathitrupaththu in ‘Ettuthogai’-Pathitrupaththu’s Parables- Tamil dynasty: Valor, Administration, Charity in Pathitrupaththu- Message to Society from Pathitrupaththu.

Total (L: 45) = 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Appreciate and apply the messages in Sanga Tamil Literature in their life.
CO2: Differentiate ‘Agathinai’ and ‘Purathinai’ in their personal and societal life.
CO3: Appreciate and apply the messages in ‘Attruppadai’ in their personal and societal life.
CO4: Appreciate and apply the messages in ‘Puranaanuru’ in their personal and societal life.
CO5: Appreciate and apply the messages in ‘Pathitrupaththu’ in their personal and societal life.
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HSMC – ELECTIVES – HUMANITIES I (ODD SEMESTER)

HU5171 LANGUAGE AND COMMUNICATION LT P C 3 0 0 3

COURSE DESCRIPTION
This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as non-verbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

Objectives
✓ To familiarize students with the concept of communication using linguistic and non-linguistic resources.
✓ To help students ask critical questions regarding facts and opinions.
✓ To provide students with the material to discuss issues such as language and power structures.
✓ To help students think critically about false propaganda and fake news.

UNIT I LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION: 9
a) Writing and Speech
b) Distinction between language structure and language use, form and function, acceptability and grammaticality
c) Gestures and Body language, pictures and symbols, cultural appropriacy
UNIT II STRUCTURE OF WRITING/CONVERSATION: 9
a) Language skills and the communication cycle; speaking and listening, writing and reading
b) Initiating and closing conversations, intervention, turn taking
c) Writing for target reader, rhetorical devices and strategies
d) Coherence and Cohesion in speech and writing

UNIT III POWER STRUCTURE AND LANGUAGE USE: 9
a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

UNIT IV MEDIA COMMUNICATION: 9
a) Print media, electronic media, social media
b) Power of media
c) Manufacturing of opinion, fake news and hidden agendas

UNIT V PERSUASIVE COMMUNICATION AND MISCOMMUNICATION: 9
a) Fundamentals of persuasive communication
b) Persuasive strategies
c) Communication barriers

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Students will be able to use linguistic and non linguistic resources of language in an integrated manner for communication.
CO2: Students will be able to analyse communication in terms of facts and opinions.
CO3: Students will be able to discuss, analyse and argue about issues related to language and power.
CO4: Communicative competency, context and situation, combination of linguistic and non-linguistic elements of communication

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OBJECTIVES:
- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT I  DEFINITION AND CLASSIFICATION OF VALUES  9
Extrinsic values- Universal and Situational values- Physical- Environmental-Sensuous- Economic-
Social-Aesthetic-Moral and Religious values

UNIT II  CONCEPTS RELATED TO VALUES  9
Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III  IDEOLOGY OF SARVODAYA  9
Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

UNIT IV  SUSTENANCE OF LIFE  9
The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V  VIEWS ON HIERARCHY OF VALUES  9
The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya
and Mahatma Gandhi

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Able to understand definition and classification of values.
CO2: Able to understand purusartha.
CO3: Able to understand sarvodaya idea.
CO4: Able to understand sustenance of life.
CO5: Able to understand views of hierarchy of values.

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TEXTBOOKS:
2. Little, William: An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)

HU5173 HUMAN RELATIONS AT WORK L T P C
3 0 0 3

OBJECTIVES:
- Illustrate human relations at work its relationship with self.
- Explain the importance of interacting with people at work to develop teamwork.
- Infer the importance of physical health in maintaining human relations at work.
- Describe the importance of staying psychologically healthy.
- Identify the essential qualities for progressing in career.

UNIT I UNDERSTANDING AND MANAGING YOURSELF 9
Human Relations and You: Self-Esteem and Self-Confidence: Self-Motivation and Goal Setting; Emotional Intelligence, Attitudes, and Happiness; Values and Ethics and Problem Solving and Creativity.

UNIT II DEALING EFFECTIVELY WITH PEOPLE 9
Communication in the Workplace; Specialized Tactics for Getting Along with Others in the Workplace; Managing Conflict; Becoming an Effective Leader; Motivating Others and Developing Teamwork; Diversity and Cross-Cultural Competence.

UNIT III STAYING PHYSICALLY HEALTHY 9
Yoga, Pranayam and Exercise: Aerobic and anaerobic.

UNIT IV STAYING PSYCHOLOGICALLY HEALTHY 9
Managing Stress and Personal Problems, Meditation.

UNIT V DEVELOPING CAREER THRUST 9

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.
TEXT BOOK:

REFERENCES:

HU5174 PSYCHOLOGICAL PROCESSES L T P C 3 0 0 3

COURSE DESCRIPTION
Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people’s psyche and behaviour around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

OBJECTIVES
The major objectives of this course is
- To develop students’ awareness on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
- To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

UNIT 1: INTRODUCTION

UNIT 2: SENSORY & PERCEPTUAL PROCESSES
Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation - movement - organization - illusion; Internal-external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

UNIT 3: COGNITION & AFFECT
UNIT 4: THINKING, PROBLEM-SOLVING & DECISION MAKING
Thinking skills - Types of thinking skills - Concrete & Abstract thinking - Convergent & Divergent - Analytical & Creative thinking - Problem & Possibility thinking - Vertical & Lateral thinking - Problem solving skills - stages of problem solving skills - Decision making - intuition and reasoning skills - Thinking and language - The thinking process- concepts, problem solving, decision-making, creative thinking; language communication.

UNIT 5: PERSONALITY & INTELLIGENCE
Psychological phenomena & Attributes of humans - cognition, motivation, and behavior - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behavior change.

References

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Understanding the basic of psychology.
CO2: Know the sensory and perceptual processes.
CO3: Understand the philosophy of mind.
CO4: Think, do take decision and to solve problems.
CO5: Understand the different dimensions of personality.

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COURSE DESCRIPTION
This course introduces students to multidisciplinary studies in Education, Technology and Society. Students will get an understanding of the relationship between education, technology and society. They will also learn about the long lasting impact of good education in a technologically advanced society.

COURSE OBJECTIVES:
The course aims
- To help learners understand the basics of different types of technology utilised in the field of education
- To make them realize the impact of education in society
- To make them evolve as responsible citizen in a technologically advanced society

UNIT I INDIAN EDUCATION SYSTEM
Gurukul to ICT education - Teacher as facilitator - Macaulay’s Minutes - English medium vs Regional medium - Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES
Learning Theories - Behaviorism - Cognitivism - Social Constructivism - Humanism Learning Styles
8. Multiple Intelligences - Emotional Intelligence - Blooms Taxonomy

UNIT III TECHNOLOGICAL ADVANCEMENTS
Web tools - Social media in education - elearning - MOOCs - Mobile assisted learning - Learning Apps - Blended learning - Self-directed learning

UNIT IV EDUCATIONAL TECHNOLOGY
Technological implications on Education – Teaching, Learning & Testing with Technology - Advantages and drawbacks – Critical analysis on the use of technology

UNIT V ETHICAL IMPLICATIONS
Plagiarism - Online Copyright issues - Ethical and value implications of education and technology on individual and society.

TOTAL: 45 PERIODS

TEACHING METHODS
Teaching modes include guest lectures, discussion groups, presentations, visual media, and a practicum style of learning.

EVALUATION
As this is course is not a content based course, it focuses more on the ethical use of technology in education and society, and so, evaluation can be based on assignments and discussions. So there is no need for an end semester examination. Internals marks can be taken for the total marks.

INTERNAL (100 % WEIGHTAGE)
(a) Written Test (40 marks)
(b) Assignment: Write a real time report of the technology use in any school / college (15 marks)
(c) Presentation: Students choose any one of the technological tools and present its relevance to education and society (15 marks)
(d) Group discussion: Students discuss in groups on case studies relating to various challenges in education and technology use in society (20 marks)

(e) Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

REFERENCES
1) Education and Social order by Bertrand Russel
2) Theories of learning by Bower and Hilgard
3) Technology and Society by Jan L Harrington

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Understand the various apps of technology apps and use them to access, generate and present information effectively.
CO2: Apply technology based resources and other media formats equitably, ethically and legally.
CO3: Integrate their technical education for betterment of society as well as their personal life.
CO4: Understand the technology of education.
CO5: Know the ethical and value Implication

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HU5176 PHILOSOPHY

OBJECTIVES
- To create a new understanding by teaching philosophy through a comparison of Indian and Western traditions.
- To Fosters critical thinking and imagination by dealing with inter-related concepts in literature and science.
- To bridge the gap between the sciences and humanities through introspective analyses.
- To nurture an understanding of the self and elucidates ways to progress towards a higher understanding of one’s self and others.

UNIT I KNOWLEDGE

UNIT II ORIGIN
UNIT III WORD

UNIT IV KNOWLEDGE AS POWER/OPPRESSION

UNIT V SELF KNOWLEDGE/BRAHMAN

TOTAL : 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Think sceptically, ask questions and to arrive at discussions.
CO2: Connect and relate different branches of thought.
CO3: Comprehends the relation between language, thought and action.
CO4: Arrive at a better understanding of self and others and forms a new outlook.

REFERENCES:
7. Bacon, Francis: Power as Knowledge

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UNIT I   INTRODUCTION
Nature and fields.

UNIT II   PSYCHOLOGY IN INDUSTRIES AND ORGANIZATIONS
Job analysis; fatigue and accidents; consumer behavior.

UNIT III   PSYCHOLOGY AND MENTAL HEALTH
Abnormality, symptoms and causes psychological disorders

UNIT IV   PSYCHOLOGY AND COUNSELING
Need of Counseling, Counselor and the Counselee, Counseling Process, Areas of Counseling.

UNIT V   PSYCHOLOGY AND SOCIAL BEHAVIOUR
Group, group dynamics, teambuilding, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL: 45 PERIODS

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COURSE OUTCOMES:
After completion of the course, students will be able to:
CO1: Know about the nature.
CO2: Know about the behavior to be followed in an industries.
CO3: Understand the principles of mental health.
CO4: Know the Counseling process.
CO5: Understand the way of effective communication.
COURSE DESCRIPTION

This course offers an introduction to Gender Studies that asks critical questions about the meanings of sex and gender in Indian society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary drawing from Indian literature and media studies, to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with class, caste and other social identities. This course also seeks to build an understanding of the concepts of gender, gender-based violence, sexuality, and rights and their impact on development through a number of discussions, exercises and reflective activities.

Objectives

✓ To familiarize students with the concepts of sex and gender through literary and media texts.
✓ To help students ask critical questions regarding gender roles in society.
✓ To provide students with the material to discuss gender issues such as gender based discrimination, violence and development.
✓ To help students think critically about gender based problems and solutions.

COURSE OUTCOMES

After completion the above subject, students will be able to understand

CO1: Students will be able to critically read literary and media texts and understand the underlying gender perspectives in them.
CO2: Students will be able to analyse current social events in the light of gender perspectives.
CO3: Students will be able to discuss, analyse and argue about issues related to gender and their impact on society, culture and development.
CO4: Students will be able to know the concept of violence
CO5: Students will be able to know the gender and culture

UNIT I: Introduction to Gender

- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender
- Social Construction of Gender

Texts:

1. Sukhu and Dukhu (Amar Chitra Katha)
2. The Cat who became a Queen (Folk tale, J. Hinton Knowles, Folk-Tales of Kashmir. London: Kegan Paul, Trench, Trübner, and Company, 1893, pp. 8-10.)

UNIT II: Gender Roles and Relations

- Types of Gender Roles
- Gender Roles and Relationships Matrix
  Gender-based Division and Valuation of Labour
TEXTBOOKS

1. Muniyakka (Short Story, Lakshmi Kannan, Nandanvan and Other Stories, Hyderabad: Orient Blackswan, 2011)

UNIT III: Gender Development Issues
- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

Texts:
2. Tell Us Marx (Poem, Mallika Sengupta, Translated by Sanjukta Dasgupta)

UNIT IV: Gender-based Violence
- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

Texts:
1. Lights Out (Play, Manjula Padmanabhan)
2. Lights Out (Video of play enacted)

UNIT V: Gender and Culture
- Gender and Film
- Gender, Media and Advertisement

Texts:
1. Mahanagar (Movie: Satyajit Ray)
2. Beti Bachao Beti Padhao Advertisements

READINGS: Relevant additional texts for readings will be announced in the class. Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

ASSESSMENT AND GRADING:
Discussion & Classroom Participation: 20%
Project/Assignment: 30%
End Term Exam: 50%

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Students will be able to critically read literary and media texts and understand the underlying
gender perspectives in them.

CO2: Students will be able to analyse current social events in the light of gender perspectives.

CO3: Students will be able to discuss, analyse and argue about issues related to gender and their impact on society, culture and development.

CO4: Students will be able to know the concept of violence

CO5: Students will be able to know the gender and culture

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HU5272 ETHICS AND HOLISTIC LIFE

OBJECTIVES:
- To emphasize the meaning and nature of ethics, human values and holistic life for leading a good, successful and happy life through continuous examination of thoughts and conduct in day to day life.
- To understand the status and responsible role of individual in abatement of value crisis in contemporary world in order to develop a civilized and human society. Understanding the process of ethical decision making through critical assessment of incidents/cases of ethical dilemmas in personal, professional and social life.
- To view the place of Ethics and Human Values in the development of individual and society through identification and cross examination of life values and world view of his/her role models in society.

UNIT I HUMAN LIFE, ITS AIM AND SIGNIFICANCE
The concept of a successful life, happy life and a meaningful life, Ethical and decision making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.

UNIT II CREATIVE AND LEADERSHIP ABILITY AND THEIR DEVELOPMENT
Intellectual, Emotional, Creative, Ethico - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude.

UNIT III HARMONY IN PERSONAL AND SOCIAL LIFE:
Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all, creating a value based work culture in hostel, classroom and other places in the campus and society.

UNIT IV CHARACTER, RIGHTEOUSNESS AND VIRTUES FOR A MEANINGFUL LIFE
Egolessness, Humility, Righteousness, Purity, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance.

UNIT V DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND
HUMAN WELFARE

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand

CO1: Enable students to understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world view.

CO2: Develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.

CO3: Enable students to cross examine their earlier decisions taken in life and understand the meaning of ethical dilemma to overcome the ethical dilemmas and engage in critical reflection.

CO4: Develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.

CO5: Enable students to develop a method for making ethically sound decisions for themselves, within hostels, classrooms, university campus and society.

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HU5273 LAW AND ENGINEERING L T P C 3 0 0 3

UNIT I THE LEGAL SYSTEM: SOURCES OF LAW AND THE COURT STRUCTURE 9
Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

UNIT II LAWS 9
Basic principles of contract law, sale of goods law, laws relating to industrial pollution, accident, environmental protection, health and safety at work, patent law, constitutional law: the supreme law of the land, Information technology law and cybercrimes.

UNIT III BUSINESS ORGANISATIONS 9
Sole traders (Business has no separate identity from you, all business property belongs to you). Partnerships: Types of Partnerships - Limited Liability Partnership, General Partnership, Limited
Partnerships. Companies: The nature of companies, Classification of companies, Formation of companies, Features of a public company, carrying on business, Directors– Their Powers and Responsibilities/Liabilities.

UNIT IV  LAW AND SOCIETY
Interdisciplinary nature of law, legal ideologies/philosophy/ schools of jurisprudence.

UNIT V  CASE STUDIES
Important legal disputes and judicial litigations

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Know the structure of law system.
CO2: Understand the types of laws.
CO3: Know the different types of organizations.
CO4: Understand the development of law for the society.
CO5: Know the important issues in legal disputes.

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HU5274  FILM APPRECIATION
COURSE DESCRIPTION
This is an intensive course designed to promote comprehensive understanding and insights into the nature of cinema and other related forms and practices. Movies, though at times are used more as escapism, they are also a true art form and expressive tool used by writers, directors and actors. This course will explore the aesthetics of cinema, the concepts behind storytelling and various other elements of a film. It will also explore the impact of movies in our society and in our lives. It also encourages students to use films as a medium to analyse visual texts and read underlying messages.

OBJECTIVES:
• To help learners understand the various movie genres and its types.
• To understand various elements that contributes to film making.
• To make them realize the impact of film in society.
• To analyse the visual media and interpret the underlying messages.

UNIT I  THE COMPONENTS OF FILMS
Story, Screenplay & Script - Actors - Director - Crew Members - Mis En Scene - Structure of A Film

UNIT II  EVOLUTION OF FILM
History of Films - Early Cinema - Silent Movies - Talkies - Film Language, Form, Movement - Film
Theories - Realist, Auteurists, Feminist, Psychonalyic, Idealogical Theories.

UNIT III FILMS ACROSS THE WORLD 9

UNIT IV INDIAN FILMS 9
The Early Era - History Of Indian Cinema - Movies for Social Change - Hindi Movies that Created Impact - Regional Movies - Documentaries - Cultural Identity.

UNIT V INTERPRETING FILMS 9
Film Criticism & Appreciation - Censorship in Movies - Cultural Representation in Movies - Television - New Media & Online Media - Films beyond Entertainment.

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Recognize types of films, their impact on society and their roles in our lives.
CO2: Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
CO3: Interpret the underlying messages in the movies.
CO4: Know the principles in interpreting the films.
CO5: Know the history of Indian cinema.

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Teaching Methods
- Each unit consists of reading materials, learning activities videos, websites. Students are expected to watch movies sometimes in class and at times at home and discuss in class.

Evaluation
- As this is course is critical appreciation course on films, there is no written end semester examination. The course is more on learning how to critically analyse a movie and appreciate its finer elements. Therefore evaluation can be based on assignments and discussions.

Internals marks can be taken for the total marks.

Internal (100 % weightage)
- Assignment 1: Write a movie review with critical analysis (20 marks).
- Assignment 2: Write a script for a scene taken from a short story / novella (20 marks).
- Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
- Group discussion: Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
- Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

REFERENCES
1. A Biographical Dictionary of Film by David Thomson, Secker & Warburg, 1975
2. Signs and Meaning in the Cinema by Peter Wollen, Secker & Warburg, 1969
3. The World Viewed by Stanley Cavell 1971
4. Film Style and Technology: History and Analysis by Barry Salt, Starword, 1983

HU5275  FUNDAMENTALS OF LANGUAGE AND LINGUISTICS  L T P C
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OBJECTIVES
• To broadly introduce students to the formal and theoretical aspects of linguistics.
• To enable learners to understand the various practical applications of language and recent findings in the field of applied linguistics.

CONTENTS:

UNIT I  LANGUAGE AND LINGUISTICS: AN OVERVIEW  9

UNIT II  MORPHOLOGY - WORDS OF LANGUAGE  9
Content and function words - morphemes -free & bound -prefixes - suffixes - roots and stems - inflectional and derivational morphology-compound words and their formation - malapropisms - slips of the tongue.

UNIT III  SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE  9

UNIT IV  PHONETICS – THE SOUNDS OF LANGUAGE  9
Speech sounds- Introduction to branches of Phonetics- The Phonetic Alphabet - IPA - Consonants - Vowels - Diphthongs- Tone and Intonation.

UNIT V  APPLIED LINGUISTICS - THE PRACTICAL APPLICATIONS OF LANGUAGE  9
Language learning and teaching (ELT)- lexicography-translation studies-computational linguistics-neurolinguistics (speech pathology and language disorders)- forensic linguistics - sociolinguistics.

TOTAL : 45 PERIODS

Teaching Methods :
Lectures, discussion.

Evaluation Internal and External :
Internal: 2 written tests + assignments, seminars, project (50+15+15+20).
External: A 3 hour written exam (50 marks)
REFERENCES:

COURSE OUTCOMES
After completion the above subject, students will be able to understand
CO1: Know the overview of language
CO2: Understand the words of language
CO3: Know the syntax of sentence pattern
CO4: Understand the sounds of language
CO5: Know the practical application of language.

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HU5276 UNDERSTANDING SOCIETY AND CULTURE THROUGH LITERATURE

OBJECTIVES
• To internalize the importance of language by understanding its role in the transformation of man.
• To look at language, literature and culture as locus of identity and change.
• To extract meaning from existing literatures and cultures.
• To identify meanings in modern life by reconnecting with lost cultures.

Unit 1 Introduction
Why study literature? Tracing the origin – pictures. Tokens as precursors of writing. Movement from three dimensions to two dimensions- Pictography. From visual to oral -Logography. Reading out literature to young children- Edmund J Farrell.

Unit 2. Reading Culture
Reading culture through language, signs and consumables- Roland Barthes. Culture through poems- Nissim Ezekiel’s ‘ The night of the Scorpion’ . ‘Nothing’s Changed’- Tatamkhulu Afrika- Apartheid. Ruskin Bond- ‘Night train at Deoli’- How real life is different from movies.

Unit 3. Identifying Meaning
Searching and locating meaning through literature. Looking for order in a chaotic world. The Myth of Sisyphus (Albert Camus) and Adi Shankar’s ‘Jagat Mithya’- the world as an illusion. The Indian version as ‘meaningless meaning’.

Unit 4. Post Modernism
‘If on a winter’s night a traveler’- Italo Calvino. The book about the reader- the experience of reading as reading. Metafiction. Selfie Culture. Visual Culture as purpose of modern life.

Unit 5. Returning to Pictures
Literature of the present- Emphasis on the visual world. Twitterature. SMS. Whatsapp language.
Consumer culture. Change in fixed gender notions. Interactive sessions. Introspection.

Reading list
1. Bond, Ruskin: ‘Night train at Deoli’
2. Ezekiel, Nissim: ‘The Night of the Scorpion’
3. Afrika, Tatamkhulu: ‘Nothing’s Changed’
4. Barthes, Roland: *Mythologies*
5. Shankaracharya: *Viveka Chudamani*
6. Camus, Albert- *The Myth of Sisyphus*
7. Calvino, Italo: *If on a winter’s night a traveler*

**COURSE OUTCOMES**
*After completion the above subject, students will be able to understand*

- CO1: Identify the connections among language, literature and culture.
- CO2: To relate between seemingly different aspects of life.
- CO3: Understands the fractions in modern life and can assimilate meanings.
- CO4: Know the different type of culture.
- CO5: Understand the development in the visual world

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