ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS AFFILIATED COLLEGES
REGULATIONS 2021
CHOICE BASED CREDIT SYSTEM

B.E. INSTRUMENTATION AND CONTROL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)
Bachelor of Instrumentation and Control Engineering curriculum is designed to prepare the graduates to acquire knowledge, skills and attitudes in order to:

- Succeed in their professional career and develop innovative products
- Intrigue in the life-long learning to get flourished with the upcoming state of art technologies.
- Demonstrate leadership capability and social responsibility.

PROGRAMME OUTCOMES (POs):
The graduates will have the ability to

1. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
2. Identify and formulate Instrumentation Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.
3. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
4. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
5. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems/processes and also being conscious of the limitations.
6. Understand the role and responsibility of the Professional Instrumentation Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
7. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for sustainable Development.
8. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
9. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
10. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
11. Demonstrate the knowledge and understanding of Engineering and Management principles and to apply these to one’s own work as a member / leader in a team to manage Electronics / Instrumentation / Control and Automation projects.

12. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

PROGRAM SPECIFIC OUTCOMES (PSOs)

After completion of Electronics and Instrumentation Engineering program, students will gain core competency skills in domains such as Electronics, Instrumentation and Process Control

1. Exhibit the fundamental concepts of measurement and control to varied measurement systems, industrial processes and configuring industrial automation system.
2. Select and apply cutting-edge technologies and adapt towards the changing interdisciplinary technologies to endow with a achievable solution.
3. Understand and analyze control problem for the interdisciplinary applications and provide suitable state of art solutions.

PEO’s – PO’s & PSO’s MAPPING

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**VIII**
ANNA UNIVERSITY, CHENNAI  
NON-AUTONOMOUS AFFILIATED COLLEGES  
REGULATIONS 2021  
CHOICE BASED CREDIT SYSTEM  
B. E, INSTRUMENTATION AND CONTROL ENGINEERING  
CURRICULUM FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTERS I TO IV

### SEMESTER – I

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$ Skill Based Course  

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$ Skill Based Course  

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

### SEMESTER IV

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

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

### SEMESTER VI

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* Open Elective – I shall be chosen from the emerging technologies

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

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

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

**Open Elective – II shall be chosen from the emerging technologies

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

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*If students undergo internship in Semester VII, then the courses offered during semester VII will be offered during semester VIII.

TOTAL CREDITS RANGE :167
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# ELECTIVE - MANAGEMENT COURSES

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### PROFESSIONAL ELECTIVE COURSES : VERTICALS

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<th>Vertical III</th>
<th>VerticalIV</th>
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<td>Internet of Things</td>
<td>Advanced Control</td>
<td>Applied Instrumentation</td>
<td>Health Care Instrumentation</td>
<td>Semiconductor / Communication</td>
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<td>Industry IoT</td>
<td>Process Modeling and Simulation</td>
<td>Fiber Optics Instrumentation</td>
<td>Biomedical Instrumentation</td>
<td>Digital VLSI</td>
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<td>Data Analytics for IoT</td>
<td>Non Linear Control</td>
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<td>Medical Imaging Systems</td>
<td>Green Electronics</td>
<td>Computer Vision</td>
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<td>IoT for Smart Agriculture</td>
<td>Adaptive Control</td>
<td>Instrumentation in Petrochemical Industry</td>
<td>Medical Robotics</td>
<td>Real Time Embedded Systems</td>
<td>Cloud Services Management</td>
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**Registration of Professional Elective Courses from Verticals:**

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

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

10
# Professional Elective Courses: Verticals

## Vertical I: Automation

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## Vertical II: Internet of Things

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

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

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

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

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

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

Complete details are available in clause 4.10 of Regulations 2021.
VERTICALS FOR MINOR DEGREE (In addition to all the verticals of other degree programmes)

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VERTICALS FOR MINOR DEGREE

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

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<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
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<tr>
<td>1.</td>
<td>CMG337</td>
<td>Foundations of Entrepreneurship</td>
<td>PEC</td>
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<td>2.</td>
<td>CMG338</td>
<td>Team Building &amp; Leadership Management for Business</td>
<td>PEC</td>
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<td>3.</td>
<td>CMG339</td>
<td>Creativity &amp; Innovation in Entrepreneurship</td>
<td>PEC</td>
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<td>4.</td>
<td>CMG340</td>
<td>Principles of Marketing Management For Business</td>
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<td>5.</td>
<td>CMG341</td>
<td>Human Resource Management for Entrepreneurs</td>
<td>PEC</td>
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<td>6.</td>
<td>CMG342</td>
<td>Financing New Business Ventures</td>
<td>PEC</td>
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### VERTICAL III: PUBLIC ADMINISTRATION

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<td>1.</td>
<td>CMG343</td>
<td>Principles of Public Administration</td>
<td>PEC</td>
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<td>CMG344</td>
<td>Constitution of India</td>
<td>PEC</td>
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<td>3.</td>
<td>CMG345</td>
<td>Public Personnel Administration</td>
<td>PEC</td>
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<td>4.</td>
<td>CMG346</td>
<td>Administrative Theories</td>
<td>PEC</td>
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<td>5.</td>
<td>CMG347</td>
<td>Indian Administrative System</td>
<td>PEC</td>
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<td>6.</td>
<td>CMG348</td>
<td>Public Policy Administration</td>
<td>PEC</td>
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### VERTICAL IV: BUSINESS DATA ANALYTICS

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<td>CMG349</td>
<td>Statistics For Management</td>
<td>PEC</td>
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<td>CMG350</td>
<td>Datamining For Business Intelligence</td>
<td>PEC</td>
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<td>3.</td>
<td>CMG351</td>
<td>Human Resource Analytics</td>
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<td>4.</td>
<td>CMG352</td>
<td>Marketing And Social Media Web Analytics</td>
<td>PEC</td>
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<td>5.</td>
<td>CMG353</td>
<td>Operation And Supply Chain Analytics</td>
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<td>CMG354</td>
<td>Financial Analytics</td>
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<td>SL. NO.</td>
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<tr>
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<td>CES331</td>
<td>Sustainable infrastructure Development</td>
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<td>Sustainable Agriculture and Environmental Management</td>
<td>PEC</td>
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<td>3.</td>
<td>CES333</td>
<td>Sustainable Bio Materials</td>
<td>PEC</td>
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<td>4.</td>
<td>CES334</td>
<td>Materials for Energy Sustainability</td>
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<td>5.</td>
<td>CES335</td>
<td>Green Technology</td>
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<td>6.</td>
<td>CES336</td>
<td>Environmental Quality Monitoring and Analysis</td>
<td>PEC</td>
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<td>7.</td>
<td>CES337</td>
<td>Integrated Energy Planning for Sustainable Development</td>
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<td>8.</td>
<td>CES338</td>
<td>Energy Efficiency for Sustainable Development</td>
<td>PEC</td>
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This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

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

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

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

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

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

(i) Physical Activity

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

(ii) Creative Arts

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

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty
mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

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

(v) Proficiency Modules

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

(vi) Lectures by Eminent People

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

(vii) Visits to Local Area

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

(viii) Familiarization to Dept./Branch & Innovations

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

(ix) Department Specific Activities

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

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

References:
Guide to Induction program from AICTE
OBJECTIVES:

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

UNIT I INTRODUCTION TO EFFECTIVE COMMUNICATION

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

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

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

UNIT II NARRATION AND SUMMATION

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

UNIT III DESCRIPTION OF A PROCESS / PRODUCT

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

UNIT IV CLASSIFICATION AND RECOMMENDATIONS

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

UNIT V EXPRESSION

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

TOTAL : 45 PERIODS

LEARNING OUTCOMES :

At the end of the course, learners will be able

- To use appropriate words in a professional context
- To gain understanding of basic grammatical structures and use them in right context.
- To read and infer the denotative and connotative meanings of technical texts
- To write definitions, descriptions, narrations and essays on various topics

TEXT BOOKS :

1. English for Engineers & Technologists  Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCE BOOKS:


ASSESSMENT PATTERN

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

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

UNIT I MATRICES

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 - Applications: Hydrostatic force and pressure, moments and centres of mass.

UNIT V MULTIPLE INTEGRALS

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

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TOTAL: 60 PERIODS
TEXT BOOKS:
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:

PH3151 ENGINEERING PHYSICS

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

UNIT I MECHANICS

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

UNIT III OSCI LATIONS, OPTICS AND LASERS 9

UNIT IV BASIC QUANTUM MECHANICS 9
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch’s theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

OUTCOMES:
After completion of this course, the students should be able to
- Understand the importance of mechanics.
- Express their knowledge in electromagnetic waves.
- Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
- Understand the importance of quantum physics.
- Comprehend and apply quantum mechanical principles towards the formation of energy bands.

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

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

UNIT I  WATER AND ITS TREATMENT


UNIT II  NANO CHEMISTRY

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

UNIT III  PHASE RULE AND COMPOSITES

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.

Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV  FUELS AND COMBUSTION

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

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO₂ emission and carbon footprint.
UNIT V ENERGY SOURCES AND STORAGE DEVICES

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

TOTAL: 45 PERIODS

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

TEXT BOOKS:

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

UNIT I  COMPUTATIONAL THINKING AND PROBLEM SOLVING  9

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

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

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

UNIT V  FILES, MODULES, PACKAGES  9
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter’s age validation, Marks range validation (0-100).

TOTAL : 45 PERIODS

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

TEXT BOOKS:

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

GE3152 HERITAGE OF TAMILS

UNIT I LANGUAGE AND LITERATURE

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

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

UNIT IV THINAI CONCEPT OF TAMILS
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.
UNIT V  CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND
INDIAN CULTURE  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. 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) (Published
by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book
and Educational Services Corporation, Tamil Nadu)

GE3152

35
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.)
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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) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

TOTAL : 15 PERIODS
OBJECTIVES:
- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

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

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

OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems..
CO4: Deploy functions to decompose a Python program.

TOTAL: 60 PERIODS
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

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

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

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVES:
- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young’s modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde’s string experiment
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

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

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

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

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

TOTAL : 30 PERIODS

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

TEXT BOOKS:

GE3172 ENGLISH LABORATORY

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

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions( filling out a bank application for example).

UNIT II NARRATION AND SUMMATION 6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings- engaging in small talk- describing requirements and abilities.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT 6
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)- talking about precautions.

UNIT IV CLASSIFICATION AND RECOMMENDATIONS 6
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.

UNIT V EXPRESSION 6
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes
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.

SEMESTER II
HS3251 PROFESSIONAL ENGLISH - II  
L T P C  
2 0 0 2

OBJECTIVES:
- To engage learners in meaningful language activities to improve their reading and writing skills
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

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

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

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

UNIT IV  REPORTING OF EVENTS AND RESEARCH  

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

TOTAL : 30 PERIODS
OUTCOMES:
At the end of the course, learners will be able
- To compare and contrast products and ideas in technical texts.
- To identify cause and effects in events, industrial processes through technical texts
- To analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.
- To report events and the processes of technical and industrial nature.
- To present their opinions in a planned and logical manner, and draft effective resumes in context of job search.

TEXT BOOKS:
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCE BOOKS:

ASSESSMENT PATTERN
Two internal assessments and an end semester examination to test students’ reading and writing skills along with their grammatical and lexical competence.
MA3251  STATISTICS AND NUMERICAL METHODS  

L  T  P  C  
3  1  0  4

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

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

UNIT II  DESIGN OF EXPERIMENTS  9 + 3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT III  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9 + 3

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

UNIT V  NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS  9 +3

TOTAL: 60 PERIODS

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

TEXT BOOKS:

REFERENCES:

PH3255 PHYSICS FOR INSTRUMENTATION ENGINEERING
(Common to E & I and I & C)
L T P C
3 0 0 3

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

UNIT I ELECTRICITY AND MAGNETISM
Coulomb’s law, electric field intensity, electric flux density, Gauss’ law, divergence, electric field and potential due to point, line, plane, and spherical charge distributions, effect of the dielectric medium, capacitance of simple configurations, Biot-Savart’s law, Ampere’s law, curl, Faraday’s law, Lorentz force, Inductance, Magneto motive force, reluctance, magnetic circuits, self and mutual inductance of simple configurations.
UNIT II  ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS  

UNIT III  SEMICONDUCTORS AND TRANSPORT PHYSICS  

UNIT IV  OPTICAL PROPERTIES OF MATERIALS  

UNIT V  NANODEVICES AND QUANTUM COMPUTING  

TOTAL: 45 PERIODS

OUTCOMES :
At the end of the course, the students should be able to
- know basics of electricity and magnetism and the influence of vectors in EMT.
- gain knowledge on the electrical and magnetic properties of materials and their applications
- understand clearly of semiconductor physics and functioning of semiconductor devices
- understand the optical properties of materials and working principles of various optical devices
- appreciate the importance of nanotechnology and nanodevices.

TEXT BOOKS :

REFERENCES :

BE3255 BASIC CIVIL AND MECHANICAL ENGINEERING

OBJECTIVES:
- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the Refrigeration & Air-conditioning system.

UNIT I PART A: OVERVIEWOF CIVILENGINEERING

UNIT I PART B: OVERVIEWOF MECHANICAL ENGINEERING

UNIT II SURVEYINGANDCIVILENGINEERINGMATERIALS

UNIT III BUILDINGCOMPONENTSANDINFRASTRUCTURE

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

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM
Terminology of Refrigeration and Air Conditioning, Principle of vapour compression and absorption system—Layout of typical domestic refrigerator—Window and Split type room Air conditioner, Properties of air - water mixture, concepts of psychometric and its process.

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

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

REFERENCES:

GE3251 ENGINEERING GRAPHICS

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

CONCEPTS AND CONVENTIONS (Not for Examination)
Importance of graphics in engineering applications — Use of drafting instruments — BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

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

UNIT II PROJECTIONOFPOINTS,LINESANDPLANE SURFACE
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of
planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNITIII PROJECTION OF SOLIDS AND FREEHANDSKETCHING 6+12
Projection of simplesolidslikeprisms,pyramids,cylinder,coneandtruncatedsolidswhentheaxisiss
inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.
Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNITIV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+12
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of theprincipalplanesandperpendiculartotheother—obtainingtrue shapeofsection. Development of lateralsurfacesofsimpleandsectionedsolids—Prisms,pyramids,cylindersandcones.
Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNITV ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12
Principles of isometric projection — isometric scale — Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.
Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

OUTCOMES:
On successful completion of this course, the student will be able to
- Use BIS conventions and specifications for engineering drawing.
- Construct the conic curves, involutes and cycloid.
- Solve practical problems involving projection of lines.
- Draw the orthographic, isometric and perspective projections of simple solids.
- Draw the development of simple solids.

TEXT BOOK:

REFERENCES:

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

EE3251 ELECTRIC CIRCUIT ANALYSIS L T P C
3 1 0 4

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

UNIT I BASIC CIRCUITS ANALYSIS 9+3

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 9+3
Network reduction: voltage and current division, source transformation - star delta conversion. Theorems - Superposition, Thevenin’s and Norton's Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem- Tellegen’s Theorem-Statement, application to DC and AC Circuits.

UNIT III TRANSIENT RESPONSE ANALYSIS 9+3

UNIT IV RESONANCE AND COUPLED CIRCUITS 9+3
UNIT V   THREE PHASE CIRCUITS

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

OUTCOMES:
After completing this course, the students will be able to:
CO1:   Explain circuit’s behavior using circuit laws.
CO2:   Apply mesh analysis/ nodal analysis / network theorems to determine behavior of the given DC and AC circuit
CO3:   Compute the transient response of first order and second order systems to step and sinusoidal input
CO4:   Compute power, line/ phase voltage and currents of the given three phase circuit
CO5:   Explain the frequency response of series and parallel RLC circuits
CO6:   Explain the behavior of magnetically coupled circuits.

TEXT BOOKS:

REFERENCES:
# NCC Credit Course Level 1

**NX3251** (ARMY WING) NCC Credit Course Level - I  |  L  |  T  |  P  |  C  
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## NCC GENERAL

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<td>NCC 2</td>
<td>Incentives</td>
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## NATIONAL INTEGRATION AND AWARENESS

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## PERSONALITY DEVELOPMENT

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## LEADERSHIP

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## SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

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**TOTAL : 30 PERIODS**
### NCC Credit Course Level 1*

#### NX3252  (NAVAL WING)  NCC Credit Course Level - I

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<td>L 1</td>
<td>Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code</td>
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<td>L 2</td>
<td>Case Studies: Shivaji, Jhasi Ki Rani</td>
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#### SOCIAL SERVICE AND COMMUNITY DEVELOPMENT

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<th>Course Code</th>
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<tr>
<td>SS 1</td>
<td>Basics, Rural Development Programmes, NGOs, Contribution of Youth</td>
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<td>Cyber and Mobile Security Awareness</td>
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**TOTAL : 30 PERIODS**
### NCC Credit Course Level 1*

**NX3253**  
* (AIR FORCE WING) NCC Credit Course Level - I  

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#### NCC GENERAL  

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<td>Aims, Objectives &amp; Organization of NCC</td>
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<td>NCC 2</td>
<td>Incentives</td>
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<td>Duties of NCC Cadet</td>
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<td>NCC 4</td>
<td>NCC Camps: Types &amp; Conduct</td>
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#### NATIONAL INTEGRATION AND AWARENESS  

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#### PERSONALITY DEVELOPMENT  

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<td>Communication Skills</td>
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<td>Group Discussion: Stress &amp; Emotions</td>
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#### LEADERSHIP  

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**TOTAL : 30 PERIODS**
GE3252  TAMILS AND TECHNOLOGY  

UNIT I  WEAVING AND CERAMIC TECHNOLOGY  
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II  DESIGN AND CONSTRUCTION TECHNOLOGY  
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  

UNIT IV  AGRICULTURE AND IRRIGATION TECHNOLOGY  
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  

TOTAL : 15 PERIODS  

TEXT-CUM-REFERENCE BOOKS  
1. நாடக மகளார் - மற்ற மகளார் - கோட்டைகள் - கலை, விளக்கங்கள் (விளக்கியல் - கலைநிலைமட்டம் மற்றும் கலாச்சார குறிப்பிட்டு).
2. காலத்திய கலை மற்றும் விளக்கங்கள் (சோதனைக் குறிப்பிட்டு).
3. விளக்கங்கள் – கலைநிலைமட்டங்கள் சார்புகள் - குறிப்பிட்டு சமாத் விளக்கியல் (சமாத் விளக்கியல் குறிப்பிட்டு).
4. கலைநிலைமட்டம் சமாத் விளக்கியல் (சமாத் விளக்கியல் குறிப்பிட்டு).
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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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)
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) Planing and
   c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

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

PART II ELECTRICAL ENGINEERING PRACTICES

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

PART III MECHANICAL ENGINEERING PRACTICES

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

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

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

SHEET METAL WORK:
   a) Making of a square tray

FOUNDRY WORK:
   a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES

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

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

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

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

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

TOTAL : 60 PERIODS
OBJECTIVES:
- To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- To gain practical experience on electric circuits and verification of theorems

LIST OF EXPERIMENTS

Familiarization of various electrical components, sources and measuring instruments

1. Simulation and experimental verification of series and parallel electrical circuit using fundamental laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin’s theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer theorem.
6. Simulation and Experimental validation of R-C,R-L and RLC electric circuit transients
7. Simulation and Experimental validation of frequency response of RLC electric circuit.
8. Design and implementation of series and parallel resonance circuit.
9. Simulation and experimental verification of three phase balanced and unbalanced star, delta networks circuit (Power and Power factor calculations).

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

TOTAL: 60 PERIODS
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 12
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 12
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 12
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 12
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 12
Speaking: describing things relatively-describing clothing-discussing safety issues(making recommendations) talking about electrical devices-describing controlling actions-Writing: job application( Cover letter + Curriculum vitae)-writing recommendations.

TOTAL: 60 PERIODS

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

Assessment Pattern
- One online / app based assessment to test speaking and writing skills
- Proficiency certification is given on successful completion of speaking and writing.
COURSE OBJECTIVES:
- To acquaint the students with Differential Equations which are significantly used in engineering problems.
- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value 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.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

**UNIT I  ORDINARY DIFFERENTIAL EQUATIONS**
9 +3

**UNIT II  PARTIAL DIFFERENTIAL EQUATIONS**
9 +3
Formation of partial differential equations – Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- Lagrange’s linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

**UNIT III  FOURIER SERIES**
9 +3
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square values - Parseval’s identity – Harmonic analysis.

**UNIT IV  LAPLACE TRANSFORMS**
9 +3

**UNIT V  Z - TRANSFORMS AND DIFFERENCE EQUATIONS**
9 +3

**TOTAL:** 60 PERIODS
**COURSE OUTCOMES:**

Students able to

CO1 To acquaint the students with Differential Equations which are significantly used in engineering problems.

CO2 Understand how to solve the given standard partial differential equations

CO3 Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.

CO4 Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO5 Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

CO6 Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

**TEXT BOOKS:**


**REFERENCES:**


COURSE OBJECTIVES:

- To understand the structure, operation and applications of electronic devices.
- To familiarize biasing of BJT & JFET devices.
- To explore the frequency response of amplifiers in various configurations.
- To learn the function of power amplifiers and negative feedback amplifiers.
- To design RC and LC tuned oscillators for a given frequency.

UNIT I  PN JUNCTION DEVICES(8+1 SKILL)  9

UNIT II  BJT AND SMALL SIGNAL AMPLIFIERS(8+1 SKILL)  9
BJT - structure, operation of NPN and PNP transistor, Input and output characteristics of CE, CB and CC configurations. DC Load Line and operating point, Need for biasing – Bias stabilization -Fixed and Voltage divider biasing. Single stage BJT amplifiers – AC analysis of CE and CC amplifier with Voltage divider bias using h-parameters - Gain and frequency response.

UNIT III  FIELD EFFECT TRANSISTORS AND THYRISTORS(8+1 SKILL)  9
JFET, MOSFET - structure, operation and characteristics, JFET Biasing - self and voltage divider biasing. FET small signal model - Analysis of CS,CG and Source follower. Thyristor - SCR operation and characteristics, UJT - operation and characteristics.

UNIT IV  DIFFERENTIAL AMPLIFIERS AND LARGESIGNAL AMPLIFIERS(8+1 SKILL)  9
Cascade amplifier, BJT Differential amplifier – DC and AC analysis of common mode gain, differential mode gain and CMRR - Single tuned amplifier - construction, operation and frequency response. Power amplifiers – class A, class B and class C (Qualitative analysis only).

UNIT V  FEEDBACK AMPLIFIERS AND OSCILLATORS(8+1 SKILL)  9
Feedback concepts, feedback topologies - voltage / current, series / shunt feedback - Transfer gain with feedback - effect of negative feedback on R_{i} and R_{o} – Condition for oscillations, RC phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators.

TOTAL 45 PERIODS

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

1. Interpretation of Data Sheet of transistors and diodes with respect to their Static and Dynamic Characteristics.
2. Familiarization of any one relevant software tool (MATLAB/ SCILAB/ LABVIEW/ Proteus/ Equivalent open source software)
3. Design and verification of simple signal conditioning circuit thro simulation.
4. Realization of signal conditioning circuit in hardware
5. Introduction to other advanced logic circuits not covered in the above syllabus

**COURSE OUTCOMES:**

**CO1** Explain the operation and characteristics of PN junction diode, Zener diode, LED and Laser diode. (L2)

**CO2** Formulate the expression for voltage gain, current gain, input resistance and output resistance of a BJT CE and CC amplifier using h-parameter model. (L5)

**CO3** Formulate the expression for voltage gain, input resistance and output resistance of FET amplifier under CS, CG and Source follower. (L5)

**CO4** Explain the operation of cascade amplifier, differential amplifier, single tuned amplifier and power amplifiers. (L2)

**CO5** Analyze the operation of negative feedback amplifiers and to design RC and LC tuned Oscillators for a given frequency range. (L4)

**TEXT BOOKS:**


**REFERENCES:**


**List of Open Source Software/ Learning website:**

1. https://nptel.ac.in/courses/117101105.
2. https://www.google.com/url?sa=t&source=web&rc=j&url=https://picture.iczhiku.com/resource/etop/WhkgD0uy0JlsYvMv.pdf&ved=2ahUKEwiLzOTqhu4AhX_-TgHefXBp0QFnoECAgQAQ&usg=AOvVaw0RFLaVzmh0NUl_3W3zqwzU
3. https://nptel.ac.in/courses/117106030
4. https://nptel.ac.in/courses/117102012
5. https://nptel.ac.in/courses/117106093

**CO’s- PO’s & PSO’s MAPPING**
COURSE OBJECTIVES:

- To study various number systems and basic theorems of Boolean algebra and gate level minimization and implementation.
- To outline the formal procedures for the analysis and design of combinational circuits.
- To analyze and design synchronous sequential circuits.
- To introduce the concept of asynchronous sequential circuits, PLCs and Logic Families.
- To introduce digital simulation techniques for development of application oriented logic circuit.

UNIT I BOOLEAN ALGEBRA AND GATE LEVEL MINIMIZATION (8+1 SKILL)  9
Review of number systems, types and conversion, binary codes, error detection and correction codes (Parity and Hamming code). Boolean theorems and properties – Boolean functions - Logic gates – Gate Level Minimization using Karnaugh Map, SOP & POS simplification, Don’t Care conditions. Implementations of Logic Functions using gates-NAND–NOR implementations.

UNIT II COMBINATIONAL LOGIC (8+1 SKILL)  9
Design of adders, subtractors, Multiplexers - Combinational logic design using Multiplexers - Demultiplexers and their use in combinational logic design –2 bitMagnitude comparator, Code Converters - BCD to Binary and Binary to BCD, Encoder, Priority Encoder - Decimal to BCD, Octal to Binary, Decoders- BCD to Decimal and BCD to Seven Segment display decoder.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC (8+1 SKILL)  9
Sequential logic - SR, JK, JKMS, D and T flip flops – characteristics and excitation table - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Mealy models- state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS, MEMORY AND LOGIC FAMILIES (8+1 SKILL)  9
Asynchronous sequential logic circuits - Transition and flow table - race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits. Memories: PROM, PLA – PAL, CPLD - FPGA. Digital Logic gate realization and characteristics of TTL, ECL, CMOS families.
UNIT V  VHDL (8+1 SKILL)

TOTAL 45 PERIODS

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

1. Interpretation of Data Sheet of all logic gates.
2. Familiarization of any one relevant software tool (MATLAB/ SCILAB/ LABVIEW/ Proteus/ Equivalent open source software).
3. Design and verification of simple signal conditioning circuit thro simulation.
4. Realization of signal conditioning circuit in hardware.
5. Introduction to other advanced logic circuits not covered in the above syllabus.

COURSE OUTCOMES:

CO1  Convert various types of codes and number system & gate level implementation of Boolean functions.(L2)
CO2  Apply K –Map for simplification and implementation of combinational logic circuit (L3)
CO3  Design the synchronous Sequential logic circuits namely counters, registers etc, (L5)
CO4  Analyze the asynchronous sequential circuits and explain the operation of memories and digital logic families (L4)
CO5  Design the VHDL coding for combinational logic and Sequential circuits. (L5)

TEXT BOOKS:


REFERENCES:


List of Open Source Software/ Learning website:

1. https://nptel.ac.in/courses/117106114
2. https://nptel.ac.in/courses/117106086
3. https://nptel.ac.in/courses/106102181
COURSE OBJECTIVES:

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

UNIT I  SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS (8+1 SKILL) 9

UNIT II  CHARACTERISTICS OF TRANSDUCERS (8+1 SKILL) 9

UNIT III  VARIABLE RESISTANCE TRANSDUCERS (8+1 SKILL) 9
Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, thermistor, hot-wire anemometer, piezo-resistive sensor and humidity sensor.
UNIT IV VARIABLE INDUCTANCE AND CAPACITANCE TRANSDUCERS (8+1 SKILL)


UNIT V OTHER SENSORS AND TRANSDUCERS (8+1 SKILL)


TOTAL: 45 PERIODS

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

1. Interpretation of Data Sheet of sensors with respect to their Static and Dynamic Characteristics.
2. Selection of Sensors for applications.
3. Familiarization of any one relevant software tool (MATLAB/ SCILAB/ LABVIEW/ Proteus/ Equivalent open source software).
4. Design and verification of simple signal conditioning circuit thro simulation.
5. Realization of signal conditioning circuit in hardware.
6. Introduction to other advanced sensors not covered in the above syllabus.

COURSE OUTCOMES:

Students able to

CO1 Understand the working principles of various types of transducers (L2).
CO2 Gain knowledge on the application areas of different sensors (L2).
CO3 Select the right sensor/transducer for a given application (L3).
CO4 Determine the static and dynamic characteristics of transducers using software packages (L4)
CO5 Design simple signal conditioning circuits for the R,L and C type of sensors (L3).
CO6 Summarize the advanced sensor technologies and sensors for specific applications.(L2)

TEXT BOOKS:

REFERENCES:


List of Open Source Software/ Learning website:

1. http://nptel.iitm.ac.in/courses.php
3. https://nptel.ac.in/content/storage2/courses/112103174/pdf/ mod2.pdf
5. https://www.analog.com
6. https://electronics-tutorials.ws/io/io-

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1-low, 2-medium, 3-high, '-' - no correlation
COURSE OBJECTIVES:

- To discuss the IC fabrication procedure.
- To learn the characteristics of Op-Amp.
- To design and construct the basic applications of Op-amp.
- To interpret the internal functional blocks and the applications of special ICs.
- To illustrate the operation of application ICs

UNIT I    IC FABRICATION (8+1 SKILL)
IC classification - fundamentals of monolithic IC technology – basic planar processes - fabrication of typical circuit - Fabrication of diodes, resistance, capacitance and FETs.

UNIT II   CHARACTERISTICS AND APPLICATIONS OF OPAMP (8+1 SKILL)

UNIT III   SPECIAL ICs(8+1 SKILL)
555 Timer - Functional block, characteristics – IC NE/SE 566 Voltage Controlled Oscillator - IC NE/SE 565 Phase Locked Loop - Analog multiplier and Divider IC AD633.

UNIT IV  APPLICATION ICs(8+1 SKILL)

UNIT V    SIGNAL CONDITIONING CIRCUITS (8+1 SKILL)
V/I and I/V converters.- differential amplifier Instrumentation amplifier -S/H circuit – DAC and ADC characteristics - D/A converter (R- 2R ladder and weighted resistor types) - A/D converter (Flash and Successive approximation types)- Design of signal conditioning circuit for RTD and strain Gauge.

TOTAL : 45 PERIODS

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

1. Interpretation of Data Sheet of ICs.
2. Familiarization of any one relevant software tool (MATLAB/ SCILAB/ LABVIEW/ Proteus/ Equivalent open source software)
3. Design and verification of simple signal conditioning circuit thro simulation.
4. Realization of signal conditioning circuit in hardware.
5. Introduction to other advanced logic circuits not covered in the above syllabus.
COURSE OUTCOMES:

CO1 Explain the IC fabrication process and discuss the fabrication of active and passive components. (L2)

CO2 Compute the gain and output voltage of the given Op-Amp circuits. (L3)

CO3 Explain the internal functional blocks and applications of ICs 555, 566, 565, and AD633. (L2)

CO4 Explain the operation of voltage regulator ICs namely LM78XX, LM79XX, LM317 and LM723. (L2)

CO5 Explain the operation and design of various signal conditioning circuits. (L2)

TEXT BOOKS:

3. David A. Bell, ‘Operational Amplifiers and Linear ICs, Oxford higher education, 2013.

REFERENCES:


List of Open Source Software/ Learning website:

3. https://nptel.ac.in/courses/108108111

CO's- PO's & PSO's MAPPING

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1- low, 2-medium, 3-high, "-" no correlation
COURSE OBJECTIVES:
- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADTs and linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

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

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

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

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

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

TOTAL  45 PERIODS

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

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


**REFERENCES:**


**List of Open Source Software/ Learning website:**

- [https://www.coursera.org/specializations/data-structures-algorithms](https://www.coursera.org/specializations/data-structures-algorithms)
- [https://nptel.ac.in/courses/112107243](https://nptel.ac.in/courses/112107243)
- [https://nptel.ac.in/courses/112105598](https://nptel.ac.in/courses/112105598)

**CO’s- PO’s & PSO’s MAPPING**

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1-low, 2-medium, 3-high, '-' no correlation
COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 Determine the Breakdown voltage, forward and reverse resistance of PN junction diode and Zener diode and calculate the ripple factor of rectifier circuits with filter.
CO2 Calculate the hybrid parameters of BJT under CE and CB configuration
CO3 Obtain the frequency response of CE amplifier and CS amplifier
CO4 Obtain the UJT and JFET parameters from the characteristics and also to calculate the gain of differential amplifier using JFET.
CO5 Design the RC and LC tuned oscillators for a given oscillating frequency.
CO6 Analyze the input and output performance of the given diode based circuit using simulation tools.

CO’s- PO’s &PSO’s MAPPING

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1-low, 2-medium, 3-high, ‘-'- no correlation
COURSE OBJECTIVES:
- To develop applications in C
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS
1. Practice of C programming using statements, expressions, decision making and iterative statements
2. Practice of C programming using Functions and Arrays
3. Implement C programs using Pointers and Structures
4. Implement C programs using Files
5. Development of real time C applications
6. Array implementation of List ADT
7. Array implementation of Stack and Queue ADTs
8. Linked list implementation of List, Stack and Queue ADTs
9. Applications of List, Stack and Queue ADTs
10. Implementation of Binary Trees and operations of Binary Trees
11. Implementation of Binary Search Trees
12. Implementation of searching techniques
13. Implementation of Sorting algorithms: Insertion Sort, Quick Sort, Merge Sort

TOTAL: 45 PERIODS

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

CO’s- PO’s & PSO’s MAPPING

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1-low, 2-medium, 3-high, ‘-’- no correlation
OBJECTIVES:
To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.
- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered.
- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD: 10 Hours
Create and format a document
Working with tables
Working with Bullets and Lists
Working with styles, shapes, smart art, charts
Inserting objects, charts and importing objects from other office tools
Creating and Using document templates
Inserting equations, symbols and special characters
Working with Table of contents and References, citations
Insert and review comments
Create bookmarks, hyperlinks, endnotes footnote
Viewing document in different modes
Working with document protection and security
Inspect document for accessibility

MS EXCEL: 10 Hours
Create worksheets, insert and format data
Work with different types of data: text, currency, date, numeric etc.
Split, validate, consolidate, Convert data
Sort and filter data
Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
Work with Lookup and reference formulae
Create and Work with different types of charts
Use pivot tables to summarize and analyse data
Perform data analysis using own formulae and functions
Combine data from multiple worksheets using own formulae and built-in functions to generate results
Export data and sheets to other file formats
Working with macros
Protecting data and Securing the workbook

MS POWERPOINT: 10 Hours
Select slide templates, layout and themes
Formatting slide content and using bullets and numbering
Insert and format images, smart art, tables, charts
Using Slide master, notes and handout master
Working with animation and transitions
Organize and Group slides
Import or create and use media objects: audio, video, animation
Perform slideshow recording and Record narration and create presentable videos

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.
COURSE OBJECTIVES:

- To introduce the measurement techniques of viscosity, humidity and moisture.
- To introduce the measurement of temperature and pressure.
- To introduce the flow measurement techniques.
- To introduce the electrical flow measurement techniques.
- To introduce the level measurement techniques and transmitters.

UNIT I  MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE  
Viscosity: Saybolt viscometer - Rotameter type and Torque type viscometers.

UNIT II  TEMPERATURE & PRESSURE MEASUREMENT  

UNIT III  FLOW MEASUREMENT  

UNIT IV  ELECTRICAL TYPE FLOW METERS  

UNIT V  LEVEL MEASUREMENT AND TRANSMITTER  
Level measurement: Float gauges - Displacer type, Ultrasonic gauge – Boiler drum level measurement :- Differential pressure method and Hydrastep method - Solid level measurement, Operation of Electronics and Smart transmitters – Principle of operation of flow, level, temperature and pressure transmitters.

TOTAL: 45 PERIODS
SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content
Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc)

1. Design of signal conditioning circuits for industrial instruments used for measurement of
temperature, pressure, flow, level.
2. Calibration of sensor and transmitters along with uncertainty measurement.
3. Configuration of smart transmitters with HART communicator.
4. Selection, installation and commissioning of transducers

COURSE OUTCOMES:

Upon completion of the course, the student should be able to:

CO1 Understand Principles and working of Viscosity, Humidity, Moisture, temperature, pressure, flow and level measuring Instruments.(L2)

CO2 Calibrate temperature, flow, level and Pressure measuring devices. (L3)

CO3 Apply measurement of Viscosity, Humidity, Moisture, temperature, pressure, flow and level in Industrial Applications. (L3)

CO4 Select and install Industrial instruments for various applications (L4)

CO5 Understand various Electrical type Industrial Instruments (L2)

TEXT BOOKS:


REFERENCES:

5. https://swayam.gov.in/ Principles of Industrial Engineering

List of Open Source Software/ Learning website:

1. http://instrumentationtoolbox.com
3. Home Instrumentation Tools.
MAPPING OF CO'S WITH PO'S AND PSO'S

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1- low, 2-medium, 3-high, ‘-’- no correlation

IC3451 AUTOMATIC CONTROL SYSTEMS  L T P C
3 1 0 4

COURSE OBJECTIVES:

- To introduce the control system components and transfer function model with their graphical representation.
- To understand the analysis of system in time domain along with steady state error.
- To introduce frequency response analysis of systems.
- To accord basic knowledge in design of compensators.
- To introduce the state space models.

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION (11+1 SKILL)  12
Control System: Terminology and Basic Structure- Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems-Synchro.

UNIT II TIME RESPONSE ANALYSIS (11+1 SKILL)  12
Transient response-steady state response-Measure of performance of the standard first order and second order system-Time domain specifications -Effect on an additional zero and an additional pole-Steady state error - Type number-PID control-Effect of PD, PI, PID control systems.

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS (11+1 SKILL)  12
UNIT IV   CONCEPTSOFSTABILITYANALYSIS (11+1 SKILL) 12
Concept of Stability-Bounded – Input Bounded – Output Bounded-Routh Hurwitz stability Criterion-

UNIT V   CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHOD(11+1SKILL)  12
State variable Representation-Conversion of state variable models to transfer Functions-
Conversion of transfer functions to state variable Models-Solution of state Equations-Concepts of
Controllability and Observability -Equivalence between transfer function and state variable
representations.

TOTAL60 PERIODS

SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content
Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc)  5
1. Explore various controllers presently used in industries.
2. Develop control structures for industrial processes.
3. Implement the controllers for various transfer functions of industrial systems.
4. Using software tools for practical exposures to the controllers used in industries by undergoing
   training.
5. Realisation of various stability criterion techniques for economical operation of process.

COURSE OUTCOMES:
CO1 To represent and develop systems in different forms using the knowledge gained (L5).
CO2 To analyses the system in time and frequency domain (L4).
CO3 To discuss the effect of PID controller in closed loop systems (L2).
CO4 To construct compensator for the linear systems in frequency domain,(L5)
CO5 To analyses the stability of physical systems(L4).
CO6 To acquire and analyses knowledge in State variable model for MIMO systems(L4)

TEXT BOOKS:

REFERENCES:
4. RamesC.Panda and T. Thyagarajan, “An Introduction to Process Modelling Identification and
List of Open Source Software/ Learning website:
1. https://nptel.ac.in/courses/112107240
2. https://onlinecourses.nptel.ac.in/noc20_me25/preview
3. https://onlinecourses.nptel.ac.in/noc20_ee90/preview

CO's- PO's & PSO's MAPPING

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1-low, 2-medium, 3-high, '-'- no correlation

IC3401 MODERN ELECTRONIC INSTRUMENTATION L T P C
3 0 0 3

COURSE OBJECTIVES:
● To introduce the meters used to measure current and voltage.
● To provide detailed study of digital interfaces and signal conditioning.
● To study electronic instruments for measurement of certain important mechanical parameters.
● To understand the basic principles in MEMS and wireless devices.
● To gain knowledge on case studies on design of typical measurement systems.

UNIT I BASIC ELECTRICAL MEASUREMENTS 9
DC Voltage Measurements – Types and Electronic voltmeter - DC Current Measurements –
ACVoltage - AC current Measurements – Measurement of frequency, time and phase.

UNIT II DIGITAL INTERFACES AND SIGNAL CONDITIONING 9
ADC Types: SAR, Dual-Slope, Flash, Sigma-Delta–DAC Types: R-2R, Sigma-Delta – IEEE-488 -
Digital filters – DFT&FFT applications in signal conditioning - PC based Measurement.

UNIT III MECHANICAL MEASUREMENTS 9
Linear Measurement: Displacement, Velocity, Acceleration – Angular Measurement: Displacement,
Velocity, Acceleration – Measurement of force and torque.

UNIT IV  MECHANICAL MICROSENSORS AND WIRELESS INSTRUMENTATION

UNIT V  DESIGN OF MEASUREMENT SYSTEMS

TOTAL 45 PERIODS

SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc) 5
1. Able to select instruments based on description of process and performance requirements.
2. Able to design and analyze signal conditioning circuits for conditioning, conversion and transmission of analog measurement signals.
3. Able to conduct measurements using appropriate instruments along with error analysis.
4. Perform calibration of given instrument using appropriated calibrations.

COURSE OUTCOMES:
CO1 To understand the principle behind measurement of Electrical/mechanical quantities..(L1)
CO2 To interpret the specifications of different ADCs/DACs/ Digital interfaces. (L2)
CO3 To gain knowledge on different types of MEMS Sensors and their merits/demerits. (L2)
CO4 To learn the basics of wireless instrumentation. (L1)
CO5 To analyze and design measurement system for simple applications.(L3)
CO6 To develop simple measurement solutions for the measuring given physical quantity.(L4)

TEXT BOOKS:

REFERENCES:

Online course
1. https://nptel.ac.in/courses/108105153/
3. https://pdonline.com/courses/e244/e244_new.htm
4. https://swayam.gov.in/nd1_noc19_ee44/
6. https://www.youtube.com/watch?v=xLjk5DrScEU

### MAPPING OF CO’S WITH PO’S AND PSO’S

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1-low, 2-medium, 3-high, ‘-‘- no correlation

### GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY

#### UNIT I ENVIRONMENT AND BIODIVERSITY
6

#### UNIT II ENVIRONMENTAL POLLUTION
6

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

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


TOTAL: 30 PERIODS

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

REFERENCES
COURSE OBJECTIVES:

- To get familiarized with the embedded hardware architecture.
- To understand the basics of RTOS and the attributes of various communication protocols.
- To build knowledge on Embedded C programming and realize the concept of peripheral interfacing.
- To get introduced with the concept of IoT and architecture of IoT systems.
- To acquire knowledge over IoT implementation tools and the core elements of IIoT.

UNIT I EMBEDDED HARDWARE ARCHITECTURE

UNIT II REAL TIME OPERATING SYSTEM & COMMUNICATION INTERFACES
Types of RTOS - Functions of RTOS - Task, Process and Threads, Interrupt handling, Multiprocessing & Multitasking and Task scheduling - Serial communication interfaces - RS232, RS485, I²C SPI and USB.

UNIT III EMBEDDED PROGRAMMING AND PERIPHERAL INTERFACING

UNIT IV INTRODUCTION TO INTERNET OF THINGS
IoT Definition and Characteristics - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - Levels of IoT Deployment - IoT Device Management - Domain specific IoTs.

UNIT V IoT IMPLEMENTATION TOOLS AND IIoT
IoT gateways - IoT analytics platforms - IoT application development using Raspberry Pi - Introduction to IIoT - IIoT Middleware Platforms - Industrial Internet Security.

TOTAL: 45+30 = 75 PERIODS

1. Implementation of specific tasks using Embedded C/Python programming
2. Interfacing input devices with 8051/PIC16F877A/LPC4088.
3. Interfacing ADC & DAC with 8051 microcontroller.
4. PWM generation using PIC16F877A/LPC4088.
5. Interfacing input and output devices with Raspberry Pi using Python.
6. IoT enabled field sensing using Raspberry Pi.
SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc)

1. Interpretation of Embedded systems architecture.
2. Familiarization of any one relevant software tool (MATLAB/ SCILAB/ LABVIEW/ Proteus/ Equivalent open source software).
3. Design and verification of embedded systems and rtos applications in any of the software.
4. Realization of embedded and rtos in hardware.
5. Able to gather and process data from IOT devices, and perform data analysis and prediction.

COURSE OUTCOMES:

The students will be able to

CO1 Understand the concept of embedded system and its architectural features
CO2 Develop embedded software using Embedded C and Python.
CO3 Integrate/Interface real world field devices with microcontrollers.
CO4 Utilize the power of RTOS for embedded applications.
CO5 Acquire real world signals and perform remote process monitoring utilizing the concept of IoT.
CO6 Design and implement IoT enabled embedded control strategy for a given application.

TEXT BOOKS:

3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun(editor)

REFERENCES:


List of Open Source Software/ Learning website:

1. https://nptel.ac.in/courses/108105057
2. https://nptel.ac/in/courses/128108016
3. https://nptel.ac.in/courses/106105193
4. https://nptel.ac.in/courses/106105172
7. https://nptel.ac.in/courses/108108123
MAPPING OF CO’S WITH PO’S AND PSO’S

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1-low, 2-medium, 3-high, ‘-‘- no correlation

IC3452 ELECTRICAL MACHINES AND DRIVES 2023

COURSE OBJECTIVES:
To impart basic knowledge on different AC& DC Machines.
- To introduce the concept of special machines to motivate the students to solve complex problems related to machines.
- To impart knowledge on testing and controlling of different machines.
- Comprehensive introduction to various power electronic devices, their structure, operating principle and characteristics.
- Overview on dc and ac drives and their control using power electronic circuits.

UNIT I DC MACHINES

UNIT II TRANSFORMERS

UNIT III THREE PHASE INDUCTION MOTOR

UNIT IV POWER SEMICONDUCTOR DEVICES AND CHARACTERISTICS
Operating principle and switching Characteristics: Power diodes, Power BJT, Power MOSFET, IGBT, SCR, TRIAC.

UNIT V DRIVES AND CONTROL
Static and Dynamic equations of dc and ac machines – Electrical breaking – Rectifier and chopper control of DC drives– Open loop and Closed loop schemes for DC and AC drives(Block diagram approach only)
SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc)  

1. Differentiate the switching characteristics of the semiconductor devices.
2. Design the SCR circuit with the help of two BJT and explain the switching characteristics for the same.
3. Elaborate the speed control of Induction motor and starting methods for the same.
4. Practically compare the characteristics of 3 φ induction motor and DC machines.
5. Discuss the no load and load test on transformers [Group seminar].

LIST OF EXPERIMENTS FOR MACHINES LAB

1. Open circuit characteristics of D.C. shunt generator.
2. Load characteristics of D.C. shunt generator.
3. Load test on D.C. shunt motor.
4. Speed control of D.C. shunt motor.
5. Open circuit and short circuit tests on single phase transformer (Determination of equivalent circuit parameters).

Minimum of five experiments to be offered from the list. Additional one or two experiments can be framed beyond the list or curriculum

COURSE OUTCOMES:

CO1 Ability to understand the terms associated with electrical machines
CO2 Ability to understand basic concepts and working principle of electrical machines
CO3 Ability to understand the performance characteristics of machines
CO4 Ability to identify suitable machines for carrying out interdisciplinary projects.
CO5 Ability to understand the motor operating principle and characteristics of motor
CO6 Ability to understand the motor operating principle and characteristics of transformer

TEXT BOOKS:

REFERENCES:

3. Lecture series on “Electrical Machines I” and “Electrical Machines II” by Dr.KrishnaVasudevan, IIT Madras.
4. NPTEL Lecture Series on “Power Electronics” by Dr.B.G.Fernandes, IIT Bombay.

List of Open Source Software/ Learning website:

1. https://nptel.ac.in/courses/108106072
2. https://nptel.ac.in/courses/108105131

MAPPING OF CO’S WITH PO’S AND PSO’S

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| CO2  | 3    | 3    | 3    | 3    | -    | -    | -    | 1    | -    | 1    | -    | -    |
| CO3  | 3    | 3    | 3    | 2    | -    | -    | -    | 1    | -    | 1    | -    | -    |
| CO4  | 3    | 3    | 3    | 3    | -    | -    | -    | 1    | -    | 1    | -    | -    |
| CO5  | 3    | 2    | 2    | 2    | -    | -    | -    | 1    | -    | 1    | -    | -    |
| CO6  | 3    | 3    | 3    | 2    | -    | -    | -    | 1    | -    | 1    | -    | -    |
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1-low, 2-medium, 3-high, ‘-’ - no correlation
OBJECTIVES:
- To design, test and characterize circuit behavior with digital and analog ICs.
- To design and test various combinational and sequential circuits.
- To introduce the functions of counter, shift register.
- To interpret and realize the basic applications of Op–amp and timer.
- To explain the behavior of special ICs.

LIST OF EXPERIMENTS:
1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Implementation of Binary to Gray code converter and vice-versa.
3. Implementation of Encoders, Decoders using logic gates and MSI devices
4. Implementation of multiplexer and de-multiplexer using logic gates and MSI devices.
5. Implementation of Shift Registers: SISO, SIPO, PISO, PIPoung MSI devices.
7. Design and testing of inverting , non-inverting amplifier and Adder
8. Design and testing of comparator and Schmitt trigger.
9. Design and testing of Integrator and Differentiator.
10. Design and testing of Astable and Monostable circuits using Timer IC NE/SE 555.
12. Simulation of combinational circuits using VHDL codes
13. Simulation of any one of the Op amp application circuit using PSPICE/SIMULINK

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1: Design and implement the given Boolean function using logic gates.
CO2: Design and verify the truth table of combinational logic circuits (code converters, encoders, decoders, multiplexer and demultiplexer).
CO3: Design and implement the Counters and Shift registers.
CO4: Design and testing of Op-Amp circuits and to simulatethe op-amp application circuit using simulation tools.
CO5: Design and testing of as table and monostable circuits using Timer IC NE/SE 555.
CO6: Design and testing of variable voltage regulator using IC LM317/LM723.

CO's- PO's & PSO's MAPPING

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1-low, 2-medium, 3-high, ’-‘- no correlation
COURSE OBJECTIVES:

- To make the students aware of basic concepts of measurement and operation of different types of transducers.
- To make the students conscious about static and dynamic characteristics of different types of transducer.
- To make the students study on the design of signal conditioning circuit for different transducers.

LIST OF EXPERIMENTS

1. Determination of Static and Dynamic characteristics of Thermocouple (J,K,E) with and without thermo-well.
2. Determination of Static and Dynamic characteristics of RTD and Thermistor.
5. Determination of Characteristic study of load cell and pressure cell.
6. Sensitivity analysis of strain gauge bridges (quarter, half and full).
7. a. Determination of Static characteristic of flapper-nozzle system
    b. Loading effect on resistive potentiometer.
8. Determination of Characteristic of seismic type accelerometer.
9. Measurement of inductance (Anderson), capacitance (Schering) and resistance (Kelvin double) using bridges.
10. Design of signal conditioning circuits for resistive & capacitive sensors
11. Design of signal conditioning circuits for inductive sensors
12. Design of cold junction compensation for Thermocouples and lead wire compensation schemes for RTD

TOTAL 45 PERIODS

COURSE OUTCOMES:

CO1  Ability to perform error analysis and uncertainty analysis.
CO2  Ability to evaluate the static and dynamic characteristics of measuring instruments.
CO3  Ability to design and construct measurement systems using different types of resistance, capacitance and inductance transducers.
CO4  Ability to apply special transducers for measurement applications.
CO5  Ability to interface and analyze different signal conditioning units.
CO6  Ability to present the results in oral form as well as in written form as a report and graph.
MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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