Vision:

To be globally recognized programme and to function as a catalyst in providing outstanding education. To develop Engineers who will excel in academia, industry, research, and to strive for sustainable technologies and societal needs.

Mission:

1. To disseminate high-quality Chemical Engineering Education.
2. To develop quality engineers and technocrats with inter-disciplinary skills.
3. To collaborate with industries for innovative concepts/ideas.
4. To perform high-impact research for the benefit of society.
PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):
1. Pursue careers as successful professionals in Chemical Engineering and related fields.
2. Lifelong learning opportunities to improve and expand technical and professional skills.
3. Design and develop eco-friendly sustainable technologies with the aid of computational skills.
4. Develop personally and professionally by accepting professional and societal responsibilities and pursuing leadership roles.
5. Adhere to the highest level of professional code of ethics.

2. PROGRAMME OUTCOMES (POs):

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

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

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

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

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

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

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

3. PROGRAM SPECIFIC OUTCOMES (PSOs):
1. Well-versed in Chemical Engineering practices and will have experience in solving structured and unstructured problems using conventional and innovative solutions.
2. Acquisition of knowledge to effectively describe the Chemical Engineering problem, analyze the data, develop potential solutions, evaluate these solutions, and present the results using their oral, written and computational skills.
3. Competency to design Chemical equipment and plants, to pursue higher studies and to become successful entrepreneur.

4. PEO / PO Mapping:

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1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
### ANNA UNIVERSITY: CHENNAI: 600 025
UNIVERSITY DEPARTMENTS
B.TECH. CHEMICAL ENGINEERING
REGULATIONS – 2023
CHOICE BASED CREDIT SYSTEM (CBCS)
CURRICULA AND SYLLABI FOR I AND II SEMESTERS

#### SEMESTER I

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<th>CODE NO.</th>
<th>COURSE TITLE</th>
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**PRACTICALS**

1. **Theory:**
   - 1. HS3161 Physics Laboratory | BSC | 0 0 2 | 2 | 1 |
   - 2. GE3162 English Laboratory - I$ | EEC | 0 0 2 | 2 | 1 |

   **Total:** 17 1 12 30 24

$ Skill Based Course

#### SEMESTER II

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**PRACTICALS**

1. **Theory:**
   - 1. GE3261 English Laboratory – II$ | EEC | 0 0 2 | 2 | 1 |
   - 2. CY3161 Chemistry Laboratory | BSC | 0 0 2 | 2 | 1 |
   - 3. GE3161 Engineering Practices Laboratory | ESC | 0 0 4 | 4 | 2 |

   **Total:** 16 1 10 27 22

$ NCC Credit Course level 1 is offered for NCC students only. Other students may enroll for NSS/NSO/YRC activity. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

$ Skill Based Course.
OBJECTIVES
- To build lexical competency and accuracy that will help learners to use language effectively.
- To comprehend the nuances of spoken and written communication in different contexts.
- To learn and use various language functions required for effective communication.
- To read and write different types of texts and comprehend their connotative and denotative meanings.
- To enhance students' listening skills by using different types of audio materials and help them extract necessary information from those materials.

UNIT I  BASICS OF COMMUNICATION  9
Listening – Telephone conversation & Writing message, gap filling; Reading – Telephone message, bio-note; Writing – Personal profile; Grammar – Simple present tense, Present continuous tense, Asking questions (wh-questions); Vocabulary – One word substitution, Synonyms

UNIT II  NARRATION  9
Listening – Travel podcast / Watching a travel documentary; Reading – An excerpt from a travelogue, Newspaper Report; Writing – Narrative (Event, personal experience etc.); Grammar – Subject – verb agreement, Simple past, Past continuous Tenses; Vocabulary – Antonyms, Word formation (Prefix and Suffix).

UNIT III  DESCRIPTION  9
Listening – Conversation, Radio/TV advertisement; Reading – A tourist brochure and planning an itinerary, descriptive article / excerpt from literature; Writing – Definitions, Descriptive writing, Checklists; Grammar – Future tense, Perfect tenses, Preposition; Vocabulary – Adjectives and Adverbs

UNIT IV  CLASSIFICATION  9
Listening – Announcements and filling a table; Reading – An article, social media posts and classifying (channel conversion – text to table); Writing – Note making, Note taking and Summarising, a classification paragraph; Grammar – Connectives, Transition words; Vocabulary – Contextual vocabulary, Words used both as noun and verb, Classification related words.

UNIT V  EXPRESSION OF VIEWS  9
Listening – Debate / Discussion; Reading – Formal letters, Letters to Editor, Opinion articles / Blogs; Writing – Letter writing/ Email writing (Enquiry / Permission, Letter to Editor); Grammar – Question tags, Indirect questions, Yes / No questions; Vocabulary – Compound words, Phrasal verbs.

Assessment
Two Written Assessments: 35% weightage each
Assignment: 30% weightage
Designing a tourist brochure / Writing an opinion article / Making a travel podcast
End Semester Exam: 3-hour written exam

TOTAL : 45 PERIODS

COURSE OUTCOMES
At the end of the course, students will be able to
CO1: Use grammar and vocabulary suitable for general context.
CO2: Comprehend the nuances of spoken and written communication.
CO3: Use descriptive and analytical words, phrases, and sentence structures in written communication.
CO4: Read different types of texts and comprehend their denotative and connotative meanings.

CO5: Write different types of texts using appropriate formats.

TEXT BOOKS:
1. “English for Science & Technology I” by Cambridge University Press, 2023
2. “English for Engineers and Technologists” Volume I by Orient Blackswan, 2022

REFERENCE BOOKS
4. www.uefap.com

CO-PO & PSO MAPPING

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

MA3151 MATRICES AND CALCULUS  L T P C  3 1 0 4

OBJECTIVESS:
- To develop the use of matrix algebra techniques in solving practical problems.
- To familiarize the student with functions of several variables.
- To solving integrals by using Beta and Gamma functions.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.
- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.

UNIT I MATRICES  (9+3)
Eigen values and Eigen vectors of a real matrix – Properties of Eigen values - Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form.

UNIT II FUNCTIONS OF SEVERAL VARIABLES  (9+3)

UNIT III INTEGRAL CALCULUS  (9+3)
Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions-Properties – Evaluation of integrals by using Beta and Gamma functions – Error functions.

UNIT IV MULTIPLE INTEGRALS (9+3)

UNIT V VECTOR CALCULUS (9+3)
Gradient of a scalar field, directional derivative – Divergence and Curl – Solenoidal and Irrotational vector fields - Line integrals over a plane curve - Surface integrals – Area of a curved surface – Volume Integral - Green’s theorem, Stoke’s and Gauss divergence theorems – Verification and applications in evaluating line, surface and volume integrals.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will be able to:
CO1: Use the matrix algebra methods for solving practical problems.
CO2: Use differential calculus ideas on several variable functions.
CO3: Apply different methods of integration in solving practical problems by using Beta and Gamma functions.
CO4: Apply multiple integral ideas in solving areas and volumes problems.
CO5: Apply the concept of vectors in solving practical problems.

TEXT BOOKS:

REFERENCES:

CO-PO Mapping

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* 1’ = Low; ‘2’ = Medium; ‘3’ = High
OBJECTIVES

- To impart knowledge on Mechanics of Materials.
- To impart knowledge of oscillations, sound and Thermal Physics
- To facilitate understanding of optics and its applications, different types of Lasers and fiber optics.
- To introduce the basics of Quantum Mechanics and its importance.
- To familiarize with crystal structure, bonding and crystal growth.

UNIT I  MECHANICS OF MATERIALS

UNIT II  OSCILLATIONS, SOUND AND THERMAL PHYSICS

UNIT III  OPTICS AND LASERS

UNIT IV  QUANTUM MECHANICS

UNIT V  CRYSTALPHYSICS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
After completion of this course, the students shall be

CO1: Understand the important mechanical properties of materials
CO2: Express the knowledge of oscillations, sound and applications of Thermal Physics
CO3: Know the basics of optics and lasers and its applications
CO4: Understand the basics and importance of quantum physics.
CO5: Understand the significance of crystal physics.
TEXT BOOKS:

REFERENCES:

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

UNIT I  POLYMER CHEMISTRY
Engineering Plastics: Polyamides, Polycarbonates and Polyurethanes. Compounding and Fabrication Techniques: Injection, Extrusion, Blow and Calendaring

UNIT II  NANO CHEMISTRY

UNIT III  CORROSION SCIENCE

UNIT IV  ENERGY SOURCES
Batteries - Characteristics - types of batteries – primary battery (dry cell), secondary battery (lead acid, lithium-ion-battery)- emerging batteries – nickel-metal hydride battery, aluminum air battery, batteries for automobiles and satellites - Fuel cells (Types) – H₂-O₂ fuel cell - Supercapacitors-Types and Applications, Renewable Energy: Solar- solar cells, DSSC

UNIT V  WATER TECHNOLOGY

OUTCOMES:
- To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
To recognize and apply basic knowledge on suitable corrosion protection technique for practical problems.

To recognize different storage devices and apply them for suitable applications in energy sectors.

To demonstrate the knowledge of water and their quality in using at different industries.

**TEXT BOOKS:**

**REFERENCE BOOKS:**

**CO - PO Mapping**

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**GE3155 ENGINEERING DRAWING**

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**COURSE OBJECTIVES:**
The learning objectives of this course is to develop in students, the engineering graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

**CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

**UNIT I  PLANE CURVES**

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

**UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACE**

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

**UNIT III  PROJECTION OF SOLIDS AND FREEHAND SKETCHING**

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined to both the principal planes by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three-Dimensional objects — Layout of views-Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination).
UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6 + 12
Sectioning of simple solids like prisms, pyramids, cylinder, and cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes. Practicing three dimensional modeling of simple truncated objects by CAD Software (Not for examination).

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6 + 12
Principles of isometric projection — isometric scale - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids, cone and cylinders by visual ray method. Creating isometric model of simple objects from orthographic projections using CAD software (Not for examination).

TOTAL : 90 PERIODS

COURSE OUTCOMES:
On successful completion of this course, the student will be able to
CO1. Draw conic curves, cycloids and involutes
CO2. Draw orthographic projections of points, lines and planes
CO3. Draw orthographic projections and free hand sketches of solids
CO4. Draw sectional views of the objects and development of surfaces.
CO5. Draw isometric and perspective views of simple solids

TEXTBOOKS:

REFERENCES:

Publication of Bureau of Indian Standards:

CO-PO & PSO MAPPING

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**GE3152 PROBLEM SOLVING AND PYTHON PROGRAMMING**

### OBJECTIVES
- To understand basics of problem solving and design solutions for computational problems.
- To apply different control structures in Python programming and solve using functions.
- To apply different data structures in Python.
- To use built-in and user defined modules in Python.
- To develop applications for file manipulation with error and exception handling in Python.

### UNIT I PROGRAMMING BASICS
6+12


**PRACTICALS:**
- Design algorithms for simple computational problems
- Develop Pseudocode and Flow charts for simple computational problems
- Develop Python programs using Input / Output operations
- Develop Python programs using operators and expressions
- Executing simple programs using Python interactive mode

### UNIT II CONTROL STATEMENTS AND FUNCTIONS
6+12


**PRACTICALS:**
- Write Python programs using simple and nested selective control statements
- Develop Python programs using simple and nested repetitive control statements
- Write Python programs to generate series and patterns using repetitive control statements
- Develop Python programs using simple functions and recursion
- Write Python programs using lambda functions

### UNIT III STRING, LIST, TUPLES
6+12


**PRACTICALS:**
- Write Python programs for operating on Strings
- Design Python programs using Lists, Nested Lists and Lists comprehensions
- Develop Python programs using Tuples, Nested Tuples, Tuple comprehensions, and Sets

### UNIT IV SETS & DICTIONARIES, FUNCTIONAL PROGRAMMING
6+12


**PRACTICALS:**
- Write Python programs creating sets and performing set operations
- Develop Python programs using Dictionary, Nested Dictionary and comprehensions
- Write Python programs by applying functional programming concepts
- Create, import, and use user-defined modules
- Organize python code using Packages

### UNIT V EXCEPTIONS AND FILE HANDLING
6+12

PRACTICALS:
- Design Python programs to handle errors and exceptions
- Write Python programs with multiple handlers for exceptions
- Write Python programs to perform various operations on files
- Write Python programs to read and update text and data files

Total Hours: 90 (30+60)

COURSE OUTCOMES
1. Understand algorithmic solutions to simple computational problems.
2. Develop Python programs using conditional statements to solve computational problems.
3. Ability to apply suitable Python data structure(s) for a given problem
4. Design modular Python programs
5. Develop Python programs over files and handle exceptions

TEXT BOOKS

REFERENCE BOOKS
4. Python official documentation and tutorial, https://docs.python.org/3/

CO’s-PO’s & PSO’s MAPPING

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TEXT-CUM-REFERENCE BOOKS

1. Civilisation, By: Dr.S.Singaravelu (Published by: International Institute of Tamil Studies).
2. Tamil Nadu: Educational Services Corporation, By: Dr.K.K.Pillay (in print).
3. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
4. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
6. 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)
7. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
8. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

TOTAL : 15 PERIODS
<table>
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<tr>
<th>UNIT I</th>
<th>LANGUAGE AND LITERATURE</th>
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<th>HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE</th>
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<tr>
<td>Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Midhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.</td>
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<td>Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.</td>
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<td>Flora and Fauna of Tamils &amp; 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.</td>
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<th>CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE</th>
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<td>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 &amp; Manuscripts – Print History of Tamil Books.</td>
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OBJECTIVES:

- To inculcate experimental skills to test basic materials' properties including materials mechanical, thermal and optical properties.
- To induce the students to familiarize themselves with the properties of sound waves and ultrasonic waves.
- To impart practical skills and to understand the characteristics of mechanical vibrations and logic operation.
- To elucidate to understand the electric and magnetic parameters of materials and semiconductors devices and sensors.

Any SEVEN Experiments

1. Torsional Pendulum - Determination of rigidity modulus of wire and moment of inertia of the disc
2. Non-uniform bending - Determination of Young's modulus of the material of the beam.
3. Uniform bending – Determination of Young's modulus of the material of the beam.
4. Lee's Disc Experiment - Determination of thermal conductivity of bad conductors.
5. Viscosity of Liquids.
6. Acoustic grating - Determination of the velocity of ultrasonic waves in liquids.
7. Ultrasonic interferometer – determination of sound velocity and liquids compressibility.
8. Laser-Determination of the wavelength of the laser using grating
   - Determination of the width of the groove of the compact disc using laser.
   - Estimation of laser parameters.
9. Air wedge - Determination of the thickness of a thin sheet/wire
10. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
    b) - Determination of bending loss of fibre.
11. Spectrometer - Determination of the wavelength of light using grating
12. Michelson Interferometer - Determination of wavelength of the monochromatic source of light.
13. Photoelectric effect – Determination of Planck’s constant
14. Black body radiation (Demonstration)
15. Melde’s string experiment - Standing waves.
16. Forced and Damped Oscillations.
17. Thermistor sensor
18. Thermocouple sensor
20. Design LCR series and parallel circuit and estimation of the resonant frequency.
22. Four Probe Set up – determination of band gap/resistivity of a material.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able

CO1: To determine various moduli of elasticity, thermal properties of materials and viscosity of liquids

CO2: To determine the velocity of ultrasonic waves in Liquids.

CO3: To calculate and analyze various optical properties.

CO4: To build and analyze the characteristics of mechanical vibrations and logic operation.

CO5: To determine the desired electric and magnetic parameters of materials, semiconductors devices and sensors.

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OBJECTIVES

- To improve the communicative competence of learners
- To help learners use language effectively in formal and informal conversations.
- To use language efficiently in expressing their opinions in discussions and talks.

UNIT I  SELF-INTRODUCTION  6
Introducing oneself; Telephone conversation, Relaying telephone message – Role play

UNIT II  NARRATION  6
Narrating one’s personal experience in front of a group (formal and informal context)
Ex.: First day in college / vacation / first achievement etc.

UNIT III  CONVERSATION  6
Making conversation – formal and informal – Turn taking and Turn giving – Small talk

UNIT IV  SHORT SPEECH  6
Giving short speeches on topics like College Clubs and their activities in the college / Campus Facilities / native place and its major attractions.

UNIT V  DISCUSSION  6
Taking part in a group discussion on general topics – Debating on topics of interest and relevance.

Assessment
Internals – 100%
Short Speeches
Group discussion

TOTAL : 30 PERIODS

Learning Outcomes
At the end of the course, students will be able to

- Communicate effectively in formal and informal contexts
- Converse appropriately and confidently with different people
- Express their opinions assertively in group discussions

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Note: The average value of this course to be used for program articulation matrix.

SEMESTER II

HS3251  ENGLISH FOR COMMUNICATION – II  L T P C
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OBJECTIVES

- To actively listen and collect relevant data from various forms of oral content like presentations, lectures and videos.
- To develop study skills and communication skills in formal and informal situations.
- To comprehend various reading materials relevant to formal context and understand the main and supporting ideas of the reading materials.
• To explore definitions, essay and report writing techniques and practice them in order to develop associated skills.
• To write effective job applications along with detailed CV for internship or placements.

UNIT I  CAUSE AND EFFECT  
Listening – Radio / TV / Podcast Interview (survivors tale) and framing a set of instructions/ Do's and Don'ts; Reading – Excerpts of Literature (short stories), Journal articles on issues like Global warming; Writing - Instructions; Official letter / email (Request for internship / Industrial visit); Grammar – If conditionals, Imperatives; Vocabulary – Cause and effect expressions, Idiom

UNIT II  COMPARE AND CONTRAST  
Listening – Product reviews and gap fill exercises, Short Talks (like TED Talks) for specific information; Reading – Graphical content (table / chart / graph) and making inferences; Writing – Compare and Contrast Essay; Grammar – Degrees of Comparison; Mixed Tenses; Vocabulary – Order of Adjectives, Transition words.

UNIT III  PROBLEM AND SOLUTION  
Listening – Group discussion (case study); Reading – Visual content (Pictures on social issues / natural disasters) for comprehension; Editorial; Writing Picture description; Problem and Solution Essay; Grammar – Modal verbs; Relative pronoun; Vocabulary – Negative prefixes, Signal words for problem and solution.

UNIT IV  REPORTING  
Listening – Oral news report; Reading – Newspaper report on survey findings – Writing – Survey report, Making recommendations; Grammar – Active and passive voice, Direct and Indirect speech; Vocabulary – Reporting verbs, Numerical adjectives.

UNIT V  PRESENTATION  
Listening – Job interview, Telephone interview; Reading - Job advertisement and company profile and making inferences; Writing – Job application (cover letter and CV) Grammar – Prepositional phrases; Vocabulary – Fixed expressions, Collocations.

Assessment
Two Written Assessments : 35% weightage each
Assignment: 30% weightage
Conducting a survey on specific topic and write a final survey report.

End Semester Exam: 3-hour written exam

TOTAL : 45 PERIODS

Learning Outcomes
On completion of the course, the students will be able to:
• Listen effectively to various oral forms of conversation, lectures, discussion and understand the main gist of the content.
• Communicate effectively in formal and informal context.
• Read and comprehend technical texts effortlessly.
• Write reports and job application for internship or placement.
• Learn to use language effectively in a professional context.

TEXT BOOKS
2. “English for Engineers and Technologists” by Orient Blackswan, 2022

REFERENCE BOOKS
4. www.uefap.com
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- 1-low, 2-medium, 3-high, "-"- no correlation
- **Note:** The average value of this course to be used for program articulation matrix.

**MA3251 ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES L T P C**

**3 1 0 4**

**OBJECTIVES:**
- To acquaint the students with Differential Equations which are significantly used in engineering problems.
- To make the students to understand the Laplace transforms techniques.
- To develop the analytic solutions for partial differential equations used in engineering by Fourier series.
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic.
- To develop Z-transform techniques in solving difference equations.

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

**UNIT II LAPLACE TRANSFORMS** (9+3)

**UNIT III FOURIER SERIES** (9+3)
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

**UNIT IV FOURIER TRANSFORMS** (9+3)
Fourier integral theorem – Fourier transform pair - Fourier sine and cosine transforms – Properties – Transform of elementary functions - Convolution theorem (without proof) – Parseval’s identity.

**UNIT V Z- TRANSFORM AND DIFFERENCE EQUATIONS** (9+3)

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**
At the end of the course, the students will be able to:
- **CO1:** Solve higher order ordinary differential equations which arise in engineering applications.
- **CO2:** Apply Laplace transform techniques in solving linear differential equations.
- **CO3:** Apply Fourier series techniques in engineering applications.
- **CO4:** Understand the Fourier transforms techniques in solving engineering problems.
CO5: Understand the Z-transforms techniques in solving difference equations.

TEXT BOOKS:

REFERENCES:

CO-PO MAPPING

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- 1’ = Low; ‘2’ = Medium; ‘3’ = High

EE3151 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C 3 0 2 4

UNIT – I ELECTRICAL CIRCUITS 9

UNIT – II ELECTRICAL MACHINES 9

UNIT – III ANALOG AND DIGITAL ELECTRONICS 9

UNIT – IV SENSORS AND TRANSDUCERS 9
Solenoids, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.
UNIT – V MEASUREMENTS AND INSTRUMENTATION


TOTAL: 45 PERIODS

Laboratory Experiments:
LIST OF EXPERIMENTS:

ELECTRICAL
1. Verification of ohms and Kirchhoff’s Laws.
2. Load test on DC Shunt Motor.
3. Load test on Single Phase Transformer.
4. Load test on 3 Phase Induction Motor.

ELECTRONICS
1. Half wave and full wave Rectifiers.
2. Application of Zener diode as shunt regulator.
3. Inverting and non-inverting amplifier using operational amplifier.

TOTAL: 30 PERIODS

COURSE OUTCOMES
Upon successful completion of the course, students should be able to:
CO 1: Compute and demonstrate the electric circuit parameters for simple problems.
CO 2: Explain the working principles and characteristics of electrical machines, electronic devices and measuring instruments.
CO 3: Identify general applications of electrical machines, electronic devices and measuring instruments.
CO 4: Analyze and demonstrate the basic electrical and electronic circuits and characteristics of electrical machines.
CO 5: Explain the types and operating principles of sensors and transducers.

Mapping of COs with POs and PSOs

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<th>COs/POs &amp; PSOs</th>
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1 – Slight, 2 – Moderate, 3 – Substantial

TEXT BOOKS:

REFERENCES:
INTRODUCTION TO CHEMICAL ENGINEERING

OBJECTIVES
1. To introduce the history and development of chemical engineering domain
2. To educate on basic calculations and transfer operations in chemical engineering.
3. To enlighten various unit processes and thermodynamic principle of chemical engineering.
4. To impart knowledge on flow sheeting to represent a chemical industry.
5. To create awareness and knowledge of software usage and applications of chemical engineering.

UNIT I  HISTORY, EVOLUTION AND ACHIEVEMENTS OF CHEMICAL ENGINEERING  6
Chemical Engineering and Chemical Technology; Historical overview and concepts of Chemical Engineering; Range of scales in Chemical Engineering; Evolution of Chemical Industries; Chemical Engineering in everyday life; Greatest achievements of Chemical Engineering.

UNIT II  UNIT OPERATIONS AND BASIC CHEMICAL CALCULATIONS  12
Units and dimensions; Fundamental concepts of Stoichiometry; Ideal gases and gas mixtures; Concepts of fluid flow, Heat and mass transfer operations and its equipments

UNIT III  UNIT PROCESSES, THERMODYNAMICS AND REACTION KINETICS  9
Description of different Unit Processes; Basics of Thermodynamics – Definitions, Thermodynamic laws, reversibility, energy, work and heat; Chemical Kinetics – Reaction rates and Reactor types; Process dynamics and control – Basic principles.

UNIT IV  CHEMICAL PROCESS INDUSTRIES AND FLOW SHEETS  9
Representation of different Unit Processes and Unit Operations; Designing of equipments; Flow sheet representation of process plants; Sulphuric acid and Soda ash manufacture; Plant visit to chemical industry.

UNIT V  SOFTWARES AND APPLICATIONS OF CHEMICAL ENGINEERING IN ALLIED FIELDS  9
Chemical Engineering Software – Computational tools like MATLAB, ASPEN PLUS, ANSYS CFD, PROSIM, DWSIM etc. Applications of Chemical Engineering in various fields like Energy, Environment, Food, Medical and Agriculture etc.

COURSE OUTCOMES:
CO1: Recall the history and development of chemical industry since its origin.
CO2: Practice basic calculations and transfer operations in chemical engineering.
CO3: Illustrate various unit processes and thermodynamic principles.
CO4: Formulate flow sheeting of a chemical industry in terms of process flow diagram.
CO5: Discuss the usage of softwares and applications of chemical engineering in diversified fields

TEXT BOOKS

REFERENCES

Course Articulation Matrix:

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1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
After QLEDs, properties of Nanomaterials, such as semiconductors, alloys, ceramics, and photonics, are being increasingly studied. These materials are used in various applications, including energy conversion, optical devices, and electronics. The UNIT introduces students to new materials and their applications, as well as various quantum technology-oriented materials.}

**OBJECTIVES**
- To make the students familiar with the different properties of materials.
- To introduce important preparation techniques of materials.
- To make the students familiar with the different properties of materials.
- To introduce the students to new materials and their applications.
- To educate students about various quantum technology-oriented materials.

**UNIT I PHYSICAL PROPERTIES OF MATERIALS**

**UNIT II PREPARATION OF MATERIALS**

**UNIT III CHARACTERIZATION OF MATERIALS**

**UNIT IV NEW MATERIALS AND APPLICATIONS**

**UNIT V QUANTUM TECHNOLOGY**

**COURSE OUTCOMES:**
After completing this course, the students should be able to:
- **CO1:** Familiar with different properties of materials
- **CO2:** Synthesize different types of materials
- **CO3:** Understand the importance of material characterization techniques
- **CO4:** Gain adequate knowledge about different types of new materials and their application
- **CO5:** Have an interest in the development of nanomaterials and apply them in practice.

**TEXT BOOKS:**

**REFERENCES:**

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<th>பொதுக் கணிதம்</th>
<th>செயல்விளையாட்டு</th>
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<th>பொழுது கணிதம்</th>
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GE3251 கணிதவியலில் நூலகம்

அசை பதிவு பதிவு பாறை கணித்தமிழ்

அசை 2 வகைப்பாடு முக்கியமான தமிழ்

அசை 3 இரும்பு கல்வியியல்

அசை 4 வகைப்பாடு முக்கிய தமிழ்

அசை 5 வகைப்பாடு முக்கிய தமிழ்

TEXT-CUM-REFERENCE BOOKS
1. சுருக்க இலக்கியம் - பாறைப் பாறை முக்கிய பாறைப் பாறை முக்கியம்
2. Civilization of the Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
4. Keeladi – Sangam City Civilization on the banks of river Vaigai (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
5. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
6. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

GE3251 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 Silapathikaram - 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. தெற்பாடு தற்போது (முன்னர் விளகும்) – சுந்தரம் விகடன் (முமனவர் புதுக்காடை).
2. தெற்பாடு தற்போது (முன்னர் விளகும்) – சுந்தரம் விகடன் (முமனவர் புதுக்காடை).
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5. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
6. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
7. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
8. 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)
9. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
10. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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**TOTAL : 30 PERIODS**

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**TOTAL : 30 PERIODS**
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TOTAL : 30 PERIODS
OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, 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 estimate the corrosion resistance of metals by weight loss method and molecular weight of polymer by viscometry.

LIST OF EXPERIMENTS:
1. Estimation of HCl using Na$_2$CO$_3$ as primary standard
2. Determination of alkalinity in water sample.
3. Determination of 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. Determination of strength of given hydrochloric acid using pH meter.
8. Determination of strength of acids in a mixture of acids using conductivity meter.
9. Estimation of iron content of the given solution using potentiometer.
10. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
11. Estimation of sodium and potassium present in water using flame photometer.
13. Determination of Glass transition temperature of a polymer
14. Phase change in a solid.
15. Corrosion experiment-weight loss method.

OUTCOMES:
After completion of the laboratory course, the student will be able to -
- analyse the water quality parameters for domestic and industrial purposes.
- determine the amount of metal ions by spectroscopic techniques.
- select a suitable polymer for industrial applications.
- quantitatively analyse the impurities in solution by electroanalytical techniques.
- predict the choice of metals for industrial purposes using corrosion studies.

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

- To comprehend visual material and transcode it into verbal content using appropriate register.
- To identify varied group discussion skills and apply them to take part in effective discussions in professional context.
- To use language effectively in a formal presentation.

UNIT I INTERVIEW IN SOCIAL CONTEXT 6
Asking questions and answering - Conducting an interview (of an achiever / survivor) – Role play

UNIT II PERSUASIVE SKILLS 6
Speaking about specifications of a product (Eg. Home appliances) – Persuasive Talk – Role play activity.

UNIT III CASE STUDY 6
Discussions on Case Study to find solutions for problems in professional contexts – Analytical discussion on various aspects of a given problem.

UNIT IV VISUAL INTERPRETATION 6
Describing visual content (Pictures/Table/Chart) using appropriate descriptive language and making appropriate inferences and giving recommendations.

UNIT V PRESENTATION 6
Making presentation with visual component (PPT slides) (job interview / project / innovative product presentation)

Assessment
Internals – 100%
Picture / Graphical description and Interpretation
Formal Presentation with visual tool (like PPT)

Learning Outcomes
At the end of the course, students will be able to
- Comprehend and transcode visual content appropriately.
- Participate effectively in formal group discussions.
- Make presentation on a given topic in a formal context.

CO-PO & PSO MAPPING

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- 1-low, 2-medium, 3-high, "-" no correlation
- Note: The average value of this course to be used for program articulation matrix.

PH3161 PHYSICS LABORATORY L T P C
0 0 2 1

OBJECTIVES:
- To inculcate experimental skills to test basic materials’ properties including materials mechanical, thermal and optical properties.
To induce the students to familiarize themselves with the properties of sound waves and ultrasonic waves.

To impart practical skills and to understand the characteristics of mechanical vibrations and logic operation.

To elucidate to understand the electric and magnetic parameters of materials and semiconductors devices and sensors

Any SEVEN Experiments

1. Torsional Pendulum - Determination of rigidity modulus of wire and moment of inertia of the disc.
2. Non-uniform bending - Determination of Young’s modulus of the material of the beam.
3. Uniform bending - Determination of Young’s modulus of the material of the beam.
4. Lee's Disc Experiment - Determination of thermal conductivity of bad conductors.
5. Viscosity of Liquids.
6. Acoustic Grating - Determination of the velocity of ultrasonic waves in liquids.
7. Ultrasonic interferometer - determination of sound velocity and liquids compressibility.
8. Laser - Determination of the wavelength of the laser using grating.
   - Determination of the width of the groove of the compact disc using laser.
   - Estimation of laser parameters.
10. a) Optical fibre - Determination of Numerical Aperture and acceptance angle.
    b) Determination of bending loss of fibre.
11. Michelson Interferometer - Determination of the wavelength of light using grating.
13. Photoelectric effect - Determination of Planck’s constant.
15. Melde’s string experiment - Standing waves.
16. Forced and Damped Oscillations.
17. Thermistor sensor.
18. Thermocouple sensor.
20. Design LCR series and parallel circuit and estimation of the resonant frequency.
22. Four Probe Set up – determination of band gap/resistivity of a material.

TOTAL 30 HOURS

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

- **CO1**: To determine various moduli of elasticity, thermal properties of materials and viscosity of liquids.
- **CO2**: To determine the velocity of ultrasonic waves in Liquids.
- **CO3**: To calculate and analyze various optical properties.
- **CO4**: To build and analyze the characteristics of mechanical vibrations and logic operation.
- **CO5**: To determine the desired electric and magnetic parameters of materials, semiconductors devices and sensors.

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**Note:** The average value of this course to be used for program articulation matrix.

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**GE3161 ENGINEERING PRACTICES LABORATORY**

**OBJECTIVES:**
To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

**GROUP – A (CIVIL & ELECTRICAL)**

1. **CIVIL ENGINEERING PRACTICES** 15

**PLUMBING:**
Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- a) Laying pipe connection to the suction side of a pump
- b) Laying pipe connection to the delivery side of a pump.
- c) Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**
Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

**STUDY EXCERSISES**
- a) Study of joints in door panels and wooden furniture
- b) Study of common industrial trusses using models.

2. **ELECTRICAL ENGINEERING PRACTICES** 15

- a) Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- b) Stair case light wiring
- c) Tube – light wiring
- d) Preparation of wiring diagrams for a given situation.
- e) Study of Iron-Box, Fan Regulator and Emergency Lamp

**GROUP – B (MECHANICAL AND ELECTRONICS)**

3. **MECHANICAL ENGINEERING PRACTICES** 15

**WELDING**
- a) Arc welding of Butt Joints, Lap Joints, and Tee Joints
- b) Gas welding demonstration.
- c) Basic Machining - Simple turning, drilling and tapping operations.
- d) Study and assembling of the following: Centrifugal pump, Mixer, Air-conditioner

**SHEET METAL PRACTICE:** Making of a square tray

**DEMONSTRATION ON FOUNDRY OPERATIONS.**

4. **ELECTRONIC ENGINEERING PRACTICES** 15

- a) Soldering simple electronic circuits and checking continuity.
- b) Assembling electronic components on a small PCB and Testing.
- c) Study of Telephone, FM radio and Low Voltage Power supplies.
COURSE OUTCOMES:
1. Ability to make common joints in carpentry and pipe connections with fittings used in plumbing works.
2. Ability to do electrical wiring for household applications.
3. Ability to weld the steel the structures and soldering of electronical connections and testing of PCBs

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