VISION:
To emerge as a Centre of excellence in the field of Industrial Engineering where the world class practices of teaching, learning and research synergize.

MISSION:
- Development of state-of-the-art curriculum to meet the dynamic industry needs.
- Knowledge dissemination through student centric teaching learning process.
- Enriching laboratories with modern facilities.
- Research contribution in the field of Industrial Engineering.
- Maintaining continuous interaction with industry.
- Cultivate the spirit of Entrepreneurship.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I. Able to solve the complex integrated problems in manufacturing and service sector.
II. Get elevated to managerial position and lead the organization competitively.
III. Enter into higher studies leading to post-graduate and research degrees.
IV. Become consultant and provide solutions to the practical problems of any organization.
V. Become an entrepreneur and be part of a supply chain or make and sell products in the open market.

PROGRAM OUTCOMES (POs)

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

<table>
<thead>
<tr>
<th>PO #</th>
<th>Graduate</th>
<th>Programme Outcome</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
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<tr>
<td>2</td>
<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
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<td>3</td>
<td>Design/development of solutions</td>
<td>Design a system or process to improve its performance, satisfying its constraints.</td>
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<td>4</td>
<td>Conduct investigations of complex problems</td>
<td>Conduct experiments &amp; collect, analyze and interpret the data.</td>
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<td>5</td>
<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
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<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
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<tr>
<td></td>
<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
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<td>Ethics</td>
<td>Interact in industry, business and society in a professional and ethical manner.</td>
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<td>9</td>
<td>Individual and team work</td>
<td>Function effectively on a multidisciplinary team by understanding team dynamics, communication, social norms and conflict management.</td>
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<td>Communication</td>
<td>Proficiency in oral and written Communication.</td>
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<td>11</td>
<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
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<tr>
<td>12</td>
<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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</table>

**PROGRAM SPECIFIC OUTCOMES (PSOs):**

By the completion of Industrial Engineering program the student will have following Program specific outcomes:

1. **Foundation:** Graduates will have a strong foundation in engineering, science and current industrial engineering practices and will have experience in solving structured and unstructured problems using conventional and innovative methodologies.

2. **Communication:** Graduates will have developed their communication and interpersonal skills through a variety of individual and team-related activities, both multi-functional and intra-disciplinary.

3. **Responsibility:** Graduates will have an understanding of ethical and professional responsibilities of an engineer and the impact of engineering solutions on society and the global environment.

4. **Design:** Graduates will be able to effectively describe the problem, analyze the data, develop potential solutions, evaluate these solutions, and present the results using their oral, written and electronic media skills.

**PEO’s – PO’s & PSO’s MAPPING:**

<table>
<thead>
<tr>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
<th>PROGRAMME OUTCOMES</th>
<th>PROGRAM SPECIFIC OUTCOMES</th>
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# ANNA UNIVERSITY, CHENNAI
## UNIVERSITY DEPARTMENTS
### REGULATIONS 2023
#### B. E. INDUSTRIAL ENGINEERING
##### CHOICE BASED CREDIT SYSTEM
### CURRICULUM AND SYLLABI FOR SEMESTERS I AND II

## SEMESTER I

<table>
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<tr>
<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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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
UNIT I  BASICS OF COMMUNICATION
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
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
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
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
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 Engineers and Technologists” Volume I by Orient Blackswan, 2022

REFERENCES
4. www.uefap.com
CO-PO & PSO MAPPING

<table>
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<tr>
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- 1-low, 2-medium, 3-high

MA3151 MATRICES AND CALCULUS (Common to all branches of B.E. / B.Tech. Programmes in I semester) L T P C 3 1 0 4

UNIT I MATRICES
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

UNIT III INTEGRAL CALCULUS
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

UNIT V VECTOR CALCULUS
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

PH3151 ENGINEERING PHYSICS L T P C 3 0 0 3

UNIT I MECHANICS OF MATERIALS 9

UNIT II OSCILLATIONS, SOUND AND THERMAL PHYSICS 9

UNIT III OPTICS AND LASERS 9
Interference - Thin film interference - Air wedge- Applications -Interferometers–Michelson Interferometer — Diffraction - CD as diffraction grating – Diffraction by crystals -Polarization -

UNIT IV QUANTUM MECHANICS
Black body radiation (Qualitative) — Planck’s hypothesis — Einstein’s theory of Radiation - Matter waves—de Broglie hypothesis - Electron microscope — Uncertainty Principle — The Schrodinger Wave equation (time-independent and time-dependent) — Meaning and Physical significance of wave function - Normalization - Particle in an infinite potential well-particle in a three-dimensional box - Degenerate energy states - Barrier penetration and quantum tunneling - Tunneling microscope.

UNIT V CRYSTAL PHYSICS

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:

CO-PO & PSO MAPPING

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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

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3: To recognize and apply basic knowledge on suitable corrosion protection technique for practical problems.
CO4: To recognize different storage devices and apply them for suitable applications in energy sectors.
CO5: To demonstrate the knowledge of water and their quality in using at different industries.
TEXT BOOKS:

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- 1’ = Low; ‘2’ = Medium; ‘3’ = High

GE3155 ENGINEERING DRAWING

COURSE OBJECTIVE:
- 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  6 + 12
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:

Special points applicable to University Examinations on Engineering Drawing:
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 only in the size of A3.
4. The students will be permitted to use appropriate scale to fit the solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.

CO-PO & PSO MAPPING

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1-low, 2-medium, 3-high
அலகு II  பாதுகாக்க சுடுகால முதல்  நவீன சுடுகால வரு - சிற்பக் கறல:

மரபு - பொறற ஓவியங்கள் முதல்  நவீன ஓவியங்கள் வறர - சிற்பக் கறல:

முதல்  நடுகல் முதல்  நவீன சிற்பங்கள் வமர - ஐம்தபொன் சிமலகள் - மதர் தெய்யும் கமல - சுடுமண சிற்பங்கள் - நொட்டுப்புறத் ததய்வங்கள் - குமரிமுமனயில் திருவள்ளுவர் சிமல - இமெக் கருவிகள் - மிருதங்கம், பமற, வீமண, யொழ், நொதஸ பரம் - தமிழர்களின் எமூகத் தபொருளொதொர வொழில்.

அலகு III  கல்விக்குறிப்பிட்டுக்கான வகை விளக்கங்கள்:

சிற்பக் கறலகள் மற்றும் வீர விறளயொட்டுகள்:

ததருக்கூத்து, கரகொட்டம், வில்லுப்பொட்டு, கணியொன் கூத்து, ஒயிலொட்டம், மதொல்பொமவக் கூத்து, சிலம்பொட்டம், வளரி, புலியொட்டம்,

அலகு IV  தமிழர்களின் திறைக்கொட்டம் பௌத்தம்:

தமிழகத்தின் தொவரங்களும், விலங்குகளும் - ததொல்கொப்பியம் மற்றும் எங்கிலக்கில் அகம் மற்றும் புறக் கொட்பொடுகள் - தமிழர்கள் மபொற்றிய அறக்மகொட்பொடு - எங்ககொலத்தில் தமிழர்கள் எழுத்தறிவும், கல்வியும் - எங்ககொலத்தில் தமிழகத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நொடுகளில் மெொழர்களின் தவற்றியை.

அலகு V  இந்தியக் கதசிய இயக்கம் மற்றும் இந்திய பைட்டிற்கு தமிழர்களின் பங்களிப்பு:

இந்திய விடுதமலப்மபொரில் தமிழர்களின் பங்கு - இந்தியொவின் பிறப்பகுதிகளில் சுயமரியொமத இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்தவட்டுகள், மகதயழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அெ்சு வரலொறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழகவரலொறு - மக்களும் பண்முட்டு - இல. விளாயத் (கோரெண்விட்டி: தமிழ்பண்முட்டு பண்முட்டு மக்களும் பணிகள் குரும்).
2. குருவியார் ஦ிவத் - பெஷோன் தங்க. குருவி. (செவகசிறு பிரசுரம்).
3. குருவியார் ஦ிவத் - பெஷோன் தங்க. குருவி. (செவகசிறு பிரசுரம்).
4. பெஷோன் - ஆன்கி விளாயத் (கோரெண்விட்டி: செவகசிறு பெஷோன்).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
UNIT I LANGUAGE AND LITERATURE

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

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

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

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழ் முறையியல் - மேம்பாடு - கல்வியியல் - கல்வி - பொடும் (தமிழில்: தமிழ் முறையியல் - மேம்பாடு - கல்வியியல் - கல்வி - பொடும்).
2. தமிழ்களின் குடும்ப – பலவனை துறை. குடும்ப பொடும். (தமிழில்: குடும்ப பொடும்).
3. தமிழ் மற்றும் தமிழ்களின் குடும்ப துறை – தமிழ் மற்றும் தமிழ்களின் குடும்ப துறை. குடும்ப பொடும். (தமிழில்: குடும்ப பொடும்).
4. பலவனை - பலவனைத் துறை. (தமிழில்: பலவனைத் துறை).
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).
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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,
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)


GE3161 ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E. / B.Tech. Programmes) L T P C 0 0 4 2

COURSE OBJECTIVE:
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) 15

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.

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

PART II ELECTRICAL ENGINEERING PRACTICES 15

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

Wiring Study:
- a) Studying an Iron-Box wiring.
- b) Studying a Fan Regulator wiring.
- c) Studying an Emergency Lamp wiring.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:
b) Demonstration of gas welding.

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

**ASSEMBLY WORK:**
- a) Assembling a centrifugal pump.
- b) Assembling a household mixer.
- c) Assembling an air conditioner.

**SHEET METAL WORK:**
- a) Making of a square tray

**FOUNDRY WORK:**
- a) Demonstrating basic foundry operations.

**PART IV ELECTRONIC ENGINEERING PRACTICES 15**

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

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

**ELECTRONIC EQUIPMENT STUDY:**
- a) Studying a FM radio.
- b) Studying an electronic telephone.

**COURSE OUTCOMES:** Upon completion of this course, the students will be able to:
- CO1: Ability to make common joints in carpentry and pipe connections with fittings used in plumbing works.
- 2. Ability to weld steel the structures
- 3. Ability to do electrical wiring and to build electronics circuits.

**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.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
After completion of the laboratory course, the student will be able to –
CO1: analyse the water quality parameters for domestic and industrial purposes.
CO2: determine the amount of metal ions by spectroscopic techniques
CO3: select a suitable polymer for industrial applications.
CO4: quantitatively analyse the impurities in solution by electroanalytical techniques.
CO5: predict the choice of metals for industrial purposes using corrosion studies.

TEXTBOOKS:

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GE3162 ENGLISH LABORATORY – I

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

UNIT II NARRATION
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
Making conversation – formal and informal – Turn taking and Turn giving – Small talk

UNIT IV SHORT SPEECH
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
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

COURSE OUTCOMES
At the end of the course, students will be able to
CO1. Communicate effectively in formal and informal contexts
CO2. Converse appropriately and confidently with different people
CO3. Express their opinions assertively in group discussions

CO-PO & PSO MAPPING

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- 1' = Low; '2' = Medium; '3' = High

HS3251 ENGLISH FOR COMMUNICATION – II

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

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

CO1. Listen effectively to various oral forms of conversation, lectures, discussion and understand the main gist of the content.
CO2. Communicate effectively in formal and informal context.
CO3. Read and comprehend technical texts effortlessly.
CO4. Write reports and job application for internship or placement.
CO5. Learn to use language effectively in a professional context.

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

REFERENCES
4. www.uefap.com

CO-PO & PSO MAPPING

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- 1' = Low; '2' = Medium; '3' = High
- Note: The average value of this course to be used for program articulation matrix.

MA3251 ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES

UNIT I ORDINARY DIFFERENTIAL EQUATIONS
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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PH3205  MATERIALS SCIENCE  L T P C  3 0 0 3

COURSE OBJECTIVES:
- To make the students understand the basics of phase diagrams and their applications
- To impart knowledge about diffusion and Phase transformations
- To introduce various mechanical properties and their measurement.
- To learn about iron-carbon systems, and about various ferrous and non-ferrous alloys.
- To introduce the preparation, properties and applications of ceramics, composites and nanomaterials.

UNIT I  PHASE DIAGRAMS  9

UNIT II  DIFFUSION AND PHASE TRANSFORMATIONS  9

UNIT III  MECHANICAL PROPERTIES  9

UNIT IV  FERROUS AND NON-FERROUS ALLOYS  9
The Fe-Fe₃C phase diagram: phases, invariant reactions, development of microstructure in eutectoid, hypo eutectoid and hypereutectoid alloys- influence of other alloying elements in the Fe-C systems - isothermal transformation diagram for eutectoid iron-carbon alloy - microstructures: Pearlite, bainite, spheroidite and martensite - steels, stainless steels and cast irons - Copper alloys - aluminium alloys - titanium alloys and their applications.

UNIT V  CERAMICS, COMPOSITES AND NANOMATERIALS  9
Ceramics - types and applications - Composites: classification, the role of matrix and reinforcement - Fiber reinforced composites – Carbon-carbon composites -Nanomaterials: types, physical, chemical and mechanical properties - carbon nanotubes - Synthesis of nanomaterials - milling, sonochemical, Physical vapour deposition (PVD), Chemical vapour deposition (CVD) - Characterization: Transmission electron microscopy - Atomic force
microscopy - X-ray powder diffraction - Nanoparticle size calculation - applications of nanomaterials.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students will

**CO1:** Gain knowledge of binary phase diagrams, and also will be able to determine the phase composition and fraction of phase

**CO2:** Understand the significance of diffusion and various phase transformations

**CO3:** Have learned about the various mechanical properties like strengthening mechanisms, and tensile, creep, fatigue and hardness.

**CO4:** Understand the Fe - C system and various microstructures in it, and also about various ferrous and non-ferrous alloys.

**CO5:** get an adequate understanding on the preparation, properties and applications of ceramics, composites and nanomaterials

REFERENCES
7. J.C.Anderson, K.D.Leaver, P.Leewers and R.D.Rawlings, Materials Science for Engineers, CRC Press, 2019

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GE3152 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C 2 0 4 4

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 1  PROGRAMMING BASICS


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 2  CONTROL STATEMENTS AND FUNCTIONS


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 3 STRING, LIST, TUPLES


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 4  SETS & DICTIONARIES, FUNCTIONAL PROGRAMMING


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 5 EXCEPTIONS AND FILE HANDLING


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

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

CO’s-PO’s & PSO’s MAPPING

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

GE3151 ENGINEERING MECHANICS L T P C 3 1 0 4

COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:
1. determining the resultant forces acting on a particle in 2D and 3D and for applying methods of equilibrium on a particle in 2D and 3D.
2. evaluating the reaction forces for bodies under equilibrium, for determining the moment of a force, moment of a couple, for resolving force into a force-couple system and for analyzing trusses
3. assessing the centroids of 2D sections / center of gravity of volumes and for calculating area moments of inertia for the sections and mass moment of inertia of solids.
4. evaluating the frictional forces acting at the contact surfaces of various engineering systems and for applying the work-energy principles on a particle.
5. determining kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I  STATICS OF PARTICLES  9+3

UNIT II  EQUILIBRIUM OF RIGID BODIES AND TRUSSES  9+3

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

UNIT IV  FRICTION AND WORK PRINCIPLES  9+3

UNIT V  DYNAMICS OF PARTICLES AND RIGID BODIES  9+3

TOTAL : 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
CO1 To determine the resultant forces acting on a particle in 2D and 3D and to apply methods of equilibrium on a particle in 2D and 3D.

CO2 Evaluate the reaction forces for bodies under equilibrium, to determine moment of a force, moment of a couple, to resolve force into a force-couple system and to analyze trusses.

CO3 Assess the centroids of 2D sections / center of gravity of volumes and to calculate area moments of inertia for the sections and mass moment of inertia of solids.

CO4 Evaluate the frictional forces acting at the contact surfaces of various engineering systems and apply the work-energy principles on a particle. Evaluate the kinetic and kinematic parameters of a particle.

CO5 Determine kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXTBOOKS:

REFERENCES:

CO-PO & PSO MAPPING

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1-lows, 2-medium, 3-high

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

UNIT – I ELECTRICAL CIRCUITS 9
DC Circuits: Ohm’s Law - Kirchhoff’s Laws – Independent and Dependent Sources – Nodal
Analysis, Mesh analysis with Independent sources only (Steady state) – AC Fundamentals: Waveforms, Average value, RMS Value, Impedance, Instantaneous Power, Real Power, Reactive Power and Apparent Power, Power Factor – Steady State Analysis of RL and RC Circuits - Introduction to Balanced 3-Phase Circuits and power measurement.

UNIT – II  ELECTRICAL MACHINES

UNIT – III  ANALOG AND DIGITAL ELECTRONICS

UNIT – IV  SENSORS AND TRANSDUCERS
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.
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1 – Slight, 2 – Moderate, 3 – Substantial

**TEXT BOOKS:**

**REFERENCES:**

**NCC Credit Course Level 1**
NX3251  (ARMY WING) NCC Credit Course Level - I

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### Social Service and Community Development

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

**TOTAL : 30 PERIODS**

### NCC Credit Course Level 1*

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### NCC General

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

### National Integration and Awareness

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

### Personality Development

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

### Leadership

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

### Social Service and Community Development

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

**TOTAL : 30 PERIODS**

### NCC Credit Course Level 1*

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அலகு I ஓரனம்ப பாறாக்கள் நெடுங்குறையாக்கம்: 3

அலகு II எழுதும்பங்காள காந்தைகள் நெடுங்குறையாக்கம்: 3

அலகு III உற்பத்தி விளையாட்டு நெடுங்குறையாக்கம்: 3

அலகு IV உயிரிங்கள் நெடுங்குறையாக்கம்: 3
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  3

UNIT IV  AGRICULTURE AND IRRIGATION TECHNOLOGY  3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V  SCIENTIFIC TAMIL & TAMIL COMPUTING  3

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழக வரலொறு – மக்களும் பண்டைய நூல் – மக்களின் பிள்மள (தவளியீடு: தமிழ்நொடு பொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கீழடி - மவமகநதிக்கமரில் எங்ககொலநகர் தொகரிகம் (ததொல்லியல் துமற்று முனையீடு).
3. தபொருமந – ஆற்றங்கமரநொகரிகம் (ததொல்லியல் துமற்று முனையீடு).
4. பம்பொருமந – அரொமந் தொகரிகம். (தவளியீடு முனையீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

PH3161  PHYSICS LABORATORY  L T P C
0 0 2 1

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.

CO-PO & PSO MAPPING

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GE3261 ENGLISH LABORATORY – II

UNIT I INTERVIEW IN SOCIAL CONTEXT
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)

TOTAL : 30 PERIODS

COURSE OUTCOMES
At the end of the course, students will be able to
CO1: Comprehend and transcode visual content appropriately.
CO2: Participate effectively in formal group discussions.
CO3: Make presentation on a given topic in a formal context.

CO-PO & PSO MAPPING

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- 1’ = Low; ‘2’ = Medium; ‘3’ = High