VISION

To be recognized as a benchmark and trend setter in Electronics and Communication Engineering domain keeping in phase with rapidly changing technologies through effective partnership with reputed academic institutions, research organizations, industries and community.

MISSION

- Create highly motivated, technologically competent human resource by imparting high quality technical education through flexible student centric updated curricula suited to students with diverse backgrounds
- Adopt best teaching and learning practices and establish state-of-the-art facilities to provide quality academic ambience for innovativeness, research and developmental activities
- Enhance collaborative activities with academic institutions and industries for evolving indigenous technological solutions to meet societal needs and nurture leadership and entrepreneurship qualities with ethical means.
- Facilitate adequate exposure to the students, faculty and staff through training in the state-of-the-art technologies, efficient administration, global outreach and benchmarking against referential institutions
ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B.E. BIOMEDICAL ENGINEERING
REGULATIONS – 2023

I. PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

Upon successful completion of this Program, Student will be able to:

I. Continually build knowledge and skills to successfully navigate the changing technology and health care challenges.
II. Establish themselves as practicing professionals in biomedical industries and engage themselves in advance study in biomedical engineering and related fields.
III. Practice as a biomedical engineer and biomedical scientist in a career involving human health and wellbeing.
IV. Demonstrate entrepreneurship skill in biomedical industries and clinical practices.
V. Engage in lifelong learning by continuing their education for advanced professional career.

II. PROGRAM OUTCOMES (POs)

<table>
<thead>
<tr>
<th>PO1</th>
<th>Engineering knowledge</th>
<th>Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</th>
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<tbody>
<tr>
<td>PO2</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>PO3</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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<tr>
<td>PO4</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>PO5</td>
<td>Modern tool usage</td>
<td>Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.</td>
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<tr>
<td>PO6</td>
<td>Engineer and Society</td>
<td>Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Civil Engineering Practice.</td>
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<tr>
<td>PO7</td>
<td>Environment and Sustainability</td>
<td>Understand the Socio economic impact of Civil Engineering solutions for sustainable development</td>
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<td>PO8</td>
<td>Ethics</td>
<td>Understand the commitment to professional ethics and responsibilities of Civil Engineers and to contribute to the comprehensive societal development</td>
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<tr>
<td>PO9</td>
<td>Individual and Team work</td>
<td>Function effectively as on individual and as member or leader in diverse teams and in multi-disciplinary settings and demonstrating a capacity for self-management and teamwork, decision-making based on open–mindedness, objectivity and rational analysis.</td>
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<td>PO10</td>
<td>Communication</td>
<td>Communicate effectively with the engineering community and also with society at large, and write reports and make effective presentations.</td>
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<td>PO11</td>
<td>Project management and finance</td>
<td>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.</td>
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<td>PO12</td>
<td>Life-long learning</td>
<td>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.</td>
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### III. PROGRAM SPECIFIC OUTCOMES (PSOs)

After completion of Biomedical Engineering Program, the students will be able to

1. Design and develop medical devices, health care information system and provide solutions for rehabilitation.
2. Apply the principles of Bioengineering for clinical applications and practice as a biomedical engineer in hospital.
3. Analyze and implement signal and image processing techniques for biosignal and medical imaging applications, develop Soft computing and AI techniques for medical applications.

PEO’s–PO’s & PSO’s MAPPING:

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<th>PEO</th>
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### SEMESTER I

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$^3$ Skill Based Course

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$^g$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.

$^3$ Skill Based Course.
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>
<thead>
<tr>
<th>CO</th>
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1-low, 2-medium, 3-high

**MA3151**

**MATRICES AND CALCULUS**

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**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 & PSO MAPPING

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1-low, 2-medium, 3-high
UNIT I  MECHANICS OF MATERIALS  9

UNIT II  OSCILLATIONS, SOUND AND THERMAL PHYSICS  9

UNIT III  OPTICS AND LASERS  9

UNIT IV  QUANTUM MECHANICS  9

UNIT V  CRYSTAL PHYSICS  9

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.

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

CO-PO & PSO MAPPING

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CY3151 ENGINEERING CHEMISTRY L T P C
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UNIT I POLYMER CHEMISTRY 9
Engineering Plastics: Polyamides, Polycarbonates and Polyurethanes. Compounding and Fabrication Techniques: Injection, Extrusion, Blow and Calendaring

UNIT II NANOCHEMISTRY 9
Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical, magnetic and catalytic). Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and
instrumentation (block diagram). Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

**UNIT III**

**CORROSION SCIENCE**  
9  

**UNIT IV**

**ENERGY SOURCES**  
9  
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**  
9  

**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:**


**REFERENCES:**

CO-PO & PSO MAPPING

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1-low, 2-medium, 3-high

GE3153 PROGRAMMING IN C

UNIT I BASICS OF C PROGRAMMING 6+12
Introduction to programming paradigms — Structure of C program - C programming: Data Types - Constants - Keywords - Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements - Decision making statements - Switch statement.

PRACTICALS:
- Designing programs with algorithms/flowchart
- Programs for i/o operations with different data types
- Programs using various operators
- Programs using decision making and branching statements

UNIT II LOOP CONTROL STATEMENTS AND ARRAYS 6+12
Iteration statements: For, while, Do-while statements, nested loops, break & continue statements - Introduction to Arrays: Declaration, Initialization - One dimensional array - Two dimensional arrays — Searching and sorting in Arrays — Strings — string handling functions - array of strings

PRACTICALS:
- Programs using for, while, do-while loops and nested loops.
- Programs using arrays and operations on arrays.
- Programs implementing searching and sorting using arrays
- Programs implementing string operations on arrays

UNIT III FUNCTIONS AND POINTERS 6+12
Modular programming - Function prototype, function definition, function call, Built-in functions – Recursion – Recursive functions - Pointers - Pointer increment, Pointer arithmetic - Parameter passing: Pass by value, Pass by reference, pointer and arrays, dynamic memory allocation with malloc/calloc

PRACTICALS:
• Programs using functions
• Programs using recursion
• Programs using pointers & strings with pointers
• Programs using Dynamic Memory Allocation

UNIT IV  STRUCTURES AND UNION  6+12
Storage class, Structure and union, Features of structures, Declaration and initialization of structures, array of structures, Pointer to structure, structure and functions, typedef, bit fields, enumerated data types, Union.

PRACTICALS:
• Programs using Structures
• Programs using Unions
• Programs using pointers to structures and self-referential structures

UNIT V  MACROS AND FILE PROCESSING  6+12

PRACTICALS:
• Programs using pre-processor directives & macros
• Programs to handle file operations
• Programs to handle file with structure

COURSE OUTCOMES:
Upon completion of the course, the students will be able to
CO1: Write simple C programs using basic constructs.
CO2: Design searching and sorting algorithms using arrays and strings.
CO3: Implement modular applications using Functions and pointers.
CO4: Develop and execute applications using structures and Unions.
CO5: Solve real world problem using files.

Total Hours: 90 (30+60)

TEXT BOOKS:

REFERENCE BOOKS:
BE3152 BASIC MECHANICAL ENGINEERING

UNIT I CASTING, FORMING, AND WELDING PROCESSES
Sand casting, lathe machine and its parts, lathe machine operations (turning, taper turning, facing, chamfering, etc.), Drilling, forming process – Bulk Deformation (Forging, Rolling), Sheet metal operation (Blanking, punching)

UNIT II WELDING AND ADDITIVE MANUFACTURING
Welding – types, Shielded Metal Arc Welding, gas welding, MIG and TIG welding, Additive manufacturing : Types and its applications

UNIT III THERMODYNAMICS
Basic Terminologies related to Thermodynamics, zeroth Law, First Law of thermodynamics, Second Law of thermodynamics, Third Law of thermodynamics, Vapor compression cycle, Air Conditioner and Refrigerator

UNIT IV IC ENGINES AND RECENT DEVELOPMENTS

UNIT V POWER PLANT ENGINEERING
Coal based power plants- working, advantages & disadvantages, Hydro Electric power plants-working, advantages & disadvantages, nuclear power plants- Types, working, advantages & disadvantages, solar power plant- working, advantages & disadvantages, wind-based power generation- working, advantages & disadvantages

TOTAL : 30 PERIODS

COURSE OUTCOMES:

CO1 Discuss the basic concepts of casting, forming, and machining processes
CO2 Explain welding, and Additive manufacturing
CO3 Discuss the basics laws and application of thermodynamics
CO4 Summarize the basics of IC engines, electric vehicles.
CO5 Explain various power generation methods
TEXTBOOKS:
4. A TEXTBOOK OF MANUFACTURING TECHNOLOGY by RK Rajput, December 2007, Panchu Publisher
5. A Text Book of Production Technology Volume I by O.P.KHANNA, Dhanpat Rai publications

REFERENCES:

*Each course must contain only five units with equal distribution of hours.

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குமரிமுமனயில் திருவள்ளுவர் சிமல – இமெக் கருவிகள் – மிருதங்கம், பமற, வீமண, யொழ், நொதஸ – தமிழர்களின் எமூகதபொருளொதொரவொழ்வில் மகொவில்களின் பங்கு.

அலகு III தாருக்கூத்து குழுக்கள் மாற்றாக நிறைவுசெய்யவுல்லது: 3 
அர்த்தகாட்சிகள், கோய்கள், விருந்துப்பார்வை, குளிர்ந்த குறித்து, இறைச்சிப் பார்வை, குறிப்பிட்டு குறித்து, விருந்துப்பார்வை, குளிர்ந்த. 

அலகு IV தமிழகத்தின் தொவரங்களும், விலங்குகளும் – ததொல்லியல் மற்றும் ஐராக்கொட்டுகள் – தமிழர்கள் மபொற்றிய அறக்மகொட்டு – எங்ககொலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – எங்ககொலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – எங்ககொலத்தில் கடல்கடந்த. 

அலகு V தமிழ் ததித்துவம் மாற்றாக நிறைவுசெய்யவுல்லது: 3 
தமிழ் விளையாட்டுப்பாணிகள், தமிழகத்தின் தொவரங்களும் – ததொல்லியல் பருப்பாணிகள் நுழைவு மாற்றாக நிறைவுசெய்யவுல்லது: 3 
தமிழ் மற்றும் கல்வித்துறைகள் – தமிழ் மற்றும் கல்வித்துறைகள்; 

text-cum-reference books:
1. தமிழ் வரலொறு – மக்களும் பண் பொடும் – தக்கத்தாக பழக்கம் (விளையாட்டு 
2. கோயிலால் சுவர் - (விளையாட்டு பிரசுரம்).
3. பொன்முதத் தொன்மையியல் கூட்து மாற்றாக நிறைவுசெய்யப்படும் (விளையாட்டு தொன்மை 
4. திருத்தகொலத்தில் தமிழகத்தின் வாழ்க்கை (விளையாட்டு தொன்மை 
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 Civilisation on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

TOTAL : 15 PERIODS
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. தமிழக வரலொறு – மக்களும் பண்பொடும் – மக.மக.பிள்மள (தவளியீடு: தமிழ்நொடுபொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கம்பீரிக கம்பியும் மசூலம்சுடு குறியுல (சிறுகிருஷ்ண பிரசுரம்).
3. சிம்பு – காலை கிளகோக்குலபிளியும் கால தொகுகோலிலி (லிங்கணமீன் தொலை தவளியீடு).
4. பொருத்துடா ாருக்குத்துக்கு பதங்கிலிலி. (ஏற்றூமீன் தக்கான் தவளியீடு).
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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PH3161 PHYSICS LABORATORY
(Common to all branches of B.E./B.Tech Programmes) 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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**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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UNIT I  CAUSE AND EFFECT  9
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  9
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  9
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  9
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  9
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

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

TOTAL : 45 PERIODS
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

MA3251 ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES

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:

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1’ = Low; ‘2’ = Medium; ‘3’ = High
UNIT I  INTRODUCTION TO HUMAN BODY  8

UNIT II  RESPIRATORY SYSTEM AND URINARY SYSTEM  9

UNIT III  BLOOD AND CARDIOVASCULAR SYSTEM  10

UNIT IV  SKELETAL AND SPECIAL SENSORY SYSTEM  9
Skeletal system: Bone types and functions – Axial Skeleton and Appendicular Skeleton. Joint - Types of Joint – Cartilage structure, types and functions. Special Sensory system- Eye, Ear and Skin.

UNIT V  NERVOUS SYSTEM  9

COURSE OUTCOMES:
On completion of this course, the student will be able to
CO1  Understand the basic structural and functional elements of human body.
CO2  Understand the gaseous exchange and fluid maintenance in the human body.
CO3  Understand the organs and structures involving in system formation and functions.
CO4  Analyze the functions of physiological system
CO5  Comprehend the activity of sensory and motor nerves.

TEXT BOOKS:
REFERENCES:

CO-PO & PSO MAPPING

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1-low, 2-medium, 3-high

GE3151 ENGINEERING MECHANICS

UNIT I STATICS OF PARTICLES 9+3
Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of
Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton’s First Law of
Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES AND TRUSSES 9+3
Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force
about a Point, Varignon’s Theorem, Rectangular Components of the Moment of a Force, Scalar
Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis,
Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force
into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three
Dimensions - Reactions at Supports and Connections – Analysis of Trusses – Method of Joints and
Method of Sections.

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   FRICITION 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:

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1-low, 2-medium, 3-high

BM3201  PROBLEM SOLVING AND PYTHON PROGRAMMING  L T P C

UNIT I  PYTHON BASICS  6+6

UNIT II  CONDITIONALS AND LOOPS  6+6

UNIT III  DATA STRUCTURES AND FUNCTIONS  6+6
List - Tuples - Dictionary - – Function Call and Returning Values – Parameter Passing – Local and Global Scope

UNIT IV  STRINGS AND MODULES  6+6

UNIT V  FILE HANDLING AND EXCEPTION HANDLING  6+6
Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

PRACTICAL EXERCISES
1. Installation of Python and exploring IDE tools
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.

**COURSE OUTCOMES:**

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

- **CO1** Develop algorithmic solutions to simple computational problems
- **CO2** Develop and execute simple Python programs using conditionals and loops
- **CO3** Use Lists, tuples, dictionaries and functions for developing Python programs.
- **CO4** Work with strings and modules in Python
- **CO5** Read and write data from/to files in Python programs.
- **CO6** Develop a software application using Python constructs

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**


**CO-PO & PSO MAPPING**

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**GE3251**

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TEXT-CUM-REFERENCE BOOKS

1. Classical Tamil Grammar – Tamil Grammar (TNTB & ESC and RMRL) (in print)
2. Tamil Grammar – Tamil Grammar (TNTB & ESC and RMRL) (in print)
3. Tamil Grammar – Tamil Grammar (TNTB & ESC and RMRL) (in print)
4. The Tamil Language – Tamil Language (TNTB & ESC and RMRL) (in print)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
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  

UNIT III  MANUFACTURING TECHNOLOGY

UNIT IV  AGRICULTURE AND IRRIGATION TECHNOLOGY

UNIT V  SCIENTIFIC TAMIL & TAMIL COMPUTING

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழக வரலை – மக்களும் பணபொடும் (தவளியீடு: தமிழ்நொட்டு பொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் (விகடன் பிரசுரம்).
3. பாடல் – அன்னக தொகுதிகள் தொகுதிகள் என்ற தமிழில் பல இலக்கியங்கள் (தவளியீடு: தவளியீடு).
4. பாடல் – அன்னக தொகுதிகள் என்ற தமிழில் (தவளியீடு).
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).
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11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)


NX3251  (ARMY WING) NCC Credit Course Level - I  L T P C

2 0 0 2

NCC GENERAL  6
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  4
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  7
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  5
L 1 Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour 'Code  3
L 2 Case Studies: Shivaji, Jhansi Ki Rani  2

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT  8
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

NX3252  (NAVAL WING) NCC Credit Course Level - I  L T P C

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PERSONALITY DEVELOPMENT 7
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 5
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 8
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

GE3161 ENGINEERING PRACTICES LABORATORY L T P C
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

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

   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.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

CO1. Ability to make common joints in carpentry and pipe connections with fittings used in plumbing works.

CO2. Ability to do electrical wiring for household applications.

CO3. Ability to weld the steel the structures and soldering of electronical connections and testing of PCBs

CO-PO & PSO MAPPING

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1-low, 2-medium, 3-high

CY3161 CHEMISTRY LABORATORY

LIST OF EXPERIMENTS:

Minimum of 8 experiments to be conducted

1. Estimation of HCl using Na₂CO₃ 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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1 - low, 2 - medium, 3 - high

GE3261 ENGLISH LABORATORY – II

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
Describing visual content (Pictures/Table/Chart) using appropriate descriptive language and making appropriate inferences and giving recommendations.

UNIT V PRESENTATION
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)

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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TOTAL : 30 PERIODS