DEPARTMENT OF BIOTECHNOLOGY
ANNA UNIVERSITY, CHENNAI

Vision:
The Department of Biotechnology is committed to evolve as a world class science and technology centre by integrating quality and ethics in teaching and research

Mission:
The mission of the department is

➢ Empowering students with an unique multidisciplinary learning experience and fostering the young minds to develop as a researcher, entrepreneur, etc.
➢ Enhancing academic and industrial collaborative research initiatives for the development of biotechnological, food and therapeutic products.
➢ Emphasizing and equipping the students towards innovative industrial and research developments.
➢ Serving the society with utmost commitment, integrity, enthusiasm, and dedication.
1. Program Educational Objectives (PEOs)
   1. Graduates will have scientific and technical competence that allows and encourages professional excellence for industry and academics.
   2. Graduates will be capable of excelling in the chosen field through effective communication, leadership, teamwork and service, while exhibiting high ethical and professional standards.
   3. Graduates will be keen in solving global and societal issues including health, safety and protection of the environment.

2. Program Outcomes (POs)

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<td><strong>Engineering knowledge:</strong> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</td>
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<td><strong>Problem analysis:</strong> 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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<td><strong>Design/development of solutions:</strong> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.</td>
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<td><strong>Conduct investigations of complex problems:</strong> 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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<td><strong>Modern tool usage:</strong> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.</td>
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<td><strong>The engineer and society:</strong> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.</td>
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<td><strong>Environment and sustainability:</strong> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</td>
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<td><strong>Ethics:</strong> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.</td>
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<td><strong>Individual and team work:</strong> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.</td>
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| 10  | **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

### 3. Program Specific Objectives (PSOs)

1. Ability to pursue biotechnology research activity by possessing the necessary technical background knowledge and hands-on technical skills.

2. Ability to demonstrate the capability of developing industrial biotechnological processes and products adopting the best ethical, safety and engineering practices for solving societal problems.

3. Ability to display biotechnological entrepreneurial skills through innovative ideas and applying the engineering principles, management concepts with ethical, legal and other considerations.

**MAPPING OF PROGRAM EDUCATIONAL OBJECTIVES (PEOS) WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OBJECTIVES**

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ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
B. TECH. INDUSTRIAL BIOTECHNOLOGY
REGULATIONS – 2023
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABI FOR SEMESTERS I AND II

SEMESTER – I

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* NCC Credit Course level 1 is offered for NCC students only. Others 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.

5 *Skill Based Course.
OBJECTIVE

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

UNIT I  BASICS OF COMMUNICATION

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

OUTCOME

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 Mapping

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MA3151 MATRICES AND CALCULUS
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OBJECTIVES:
- To develop the use of matrix algebra techniques in solving practical problems.
- To familiarize the student with functions of several variables.
- To solving integrals by using Beta and Gamma functions.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.
- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.

UNIT I MATRICES
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

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

REFERENCE BOOKS

CO-PO Mapping

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• 1’ = Low; ‘2’ = Medium; ‘3’ = High
OBJECTIVES:
- To impart knowledge on Mechanics of Materials.
- To impart knowledge of oscillations, sound and Thermal Physics
- To facilitate understanding of optics and its applications, different types of Lasers and fiber optics.
- To introduce the basics of Quantum Mechanics and its importance.
- To familiarize with crystal structure, bonding and crystal growth.

UNIT I MECHANICS OF MATERIALS

UNIT II OSCILLATIONS, SOUND AND THERMAL PHYSICS

UNIT III OPTICS AND LASERS

UNIT IV QUANTUM MECHANICS

UNIT V CRYSTAL PHYSICS

TOTAL:45 PERIODS

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:

REFERENCE BOOKS:

Course Articulation Matrix

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CY3151 ENGINEERING CHEMISTRY

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

UNIT I POLYMER CHEMISTRY

Engineering Plastics: Polyamides, Polycarbonates and Polyurethanes. Compounding and Fabrication Techniques: Injection, Extrusion, Blow and Calendaring
UNIT II NANOCELLERISTRY 9

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

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

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 I PROGRAMMING BASICS 6+12

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

UNIT II CONTROL STATEMENTS AND FUNCTIONS 6+12

PRACTICALS:
- Write Python programs using simple and nested selective control statements
- Develop Python programs using simple and nested repetitive control statements
- Write Python programs to generate series and patterns using repetitive control statements
- Develop Python programs using simple functions and recursion
- Write Python programs using lambda functions
UNIT III  STRING, LIST, TUPLES  6+12
PRACTICALS:
- Write Python programs for operating on Strings
- Design Python programs using Lists, Nested Lists and Lists comprehensions
- Develop Python programs using Tuples, Nested Tuples, Tuple comprehensions, and Sets

UNIT IV  SETS & DICTIONARIES, FUNCTIONAL PROGRAMMING  6+12
PRACTICALS:
- Write Python programs creating sets and performing set operations
- Develop Python programs using Dictionary, Nested Dictionary and comprehensions
- Write Python programs by applying functional programming concepts
- Create, import, and use user-defined modules
- Organize python code using Packages

UNIT V  EXCEPTIONS AND FILE HANDLING  6+12
PRACTICALS:
- Design Python programs to handle errors and exceptions
- Write Python programs with multiple handlers for exceptions
- Write Python programs to perform various operations on files
- Write Python programs to read and update text and data files

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

TEXT BOOKS

REFERENCE BOOKS

TOTAL: 90 (30+60) PERIODS
CO's-PO's & PSO's MAPPING

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

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

UNIT I : LANGUAGE AND LITERATURE


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

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue
at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

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

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

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

TOTAL 15 HOURS

TEXT CUM REFERENCE BOOKS:
1. தமிழகவரலொறு – மக்களும் பண்பொடும் – மக.மக.பிள்மள (தவளியீடு: தமிழ்நொடுபொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. தலநீரிக்க தமிழ் – பொருளார் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. சிற்பமு – தொலைதலைச்சார் பூங்கான துறுத்தல் தொலைப்பி (தலநீரிக்க தமிழ் தவளியீடு).
4. பொருளார் – இல.சுந்தரம். தவளியீடு (தலநீரிக்க தமிழ் தவளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
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CY3161 CHEMISTRY LABORATORY L T P C
(Minimum of 8 experiments to be conducted) 0 0 2 1

OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters,
such as, alkalinity, hardness, DO, chloride and copper.

- To induce the students to familiarize with electroanalytical techniques such as, pHmetry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To estimate the corrosion resistance of metals by weight loss method and molecular weight of polymer by viscometry.

**LIST OF EXPERIMENTS:**

1. Estimation of HCl using 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.
   1. Determination of chloride content of water sample by Argentometric method.
   2. Estimation of copper content of the given solution by Iodometry.
   3. Determination of strength of given hydrochloric acid using pH meter.
   4. Determination of strength of acids in a mixture of acids using conductivity meter.
   5. Estimation of iron content of the given solution using potentiometer.
   6. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
7. Estimation of sodium and potassium present in water using flame photometer.
9. Determination of Glass transition temperature of a polymer
10. Phase change in a solid.

**TOTAL: 30 PERIODS**

**OUTCOME**

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

**TEXT BOOKS**


**CO - PO Mapping**

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

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

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

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

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

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

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

Assessment

- Internals – 100%
- Short Speeches
- Group discussion

TOTAL  30 HOURS

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

Course Articulation Matrix

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

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

UNIT I  CAUSE AND EFFECT  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

TOTAL : 45 PERIODS

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

REFERENCE BOOKS
4. www.uefap.com

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MA3251 ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES L T P C 3 1 0 4

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

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 9 + 3

UNIT II LAPLACE TRANSFORMS 9 + 3
Existence theorem - Transform of standard functions – Transform of Unit step function and Dirac delta function – Basic properties - Shifting theorems - Transforms of derivatives and integrals – Transform of periodic functions - Initial and Final value theorem - Inverse Laplace - Convolution theorem (without proof) – Solving Initial value problems by using
Laplace Transform techniques.

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) – Parsevals’s identity.

UNIT V  Z – TRANSFORM AND DIFFERENCE EQUATIONS  9 + 3

TOTAL: 60 PERIODS

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

REFERENCE BOOKS
COPO Mapping

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

IB3251 BIOORGANIC CHEMISTRY L TP C

OBJECTIVES
- enable the students to understand the basics concepts of chemical reactions
- make students understand the kinetics and its reaction mechanism

UNIT I BONDING AND STEREOCHEMISTRY
Atoms Electrons and orbitals - Covalent Bonds - Octet rule - Polar Covalent Bonds - Electronegativity- formal charge - Resonance Acids and Bases - Arrhenius and Bronsted Lowry Theories - Acid Base equilibria - SP3 hybridization - Conformations analysis ethane, butane and cyclohexane - Cis- trans isomerism. Stereochemical activity around the tetrahedral carbon – optical activity - Conformation of the peptide bond

UNIT II MECHANISMS OF SUBSTITUTION AND ADDITION REACTIONS
SN1 and SN2 reactions on tetrahedral carbon- nucleophiles-mechanism steric effects– nucleophilic addition on Acetals and ketals -Aldehyde and ketone groups – reactions of carbonyl group with amines- acid catalyzed ester hydrolysis – Saponification of an ester- hydrolysis of amides. Ester enolates - claisen. condensation – Michael condensation

UNIT III KINETICS AND MECHANISM

UNIT IV CATALYSIS
Reactivity – Coenzymes – Proton transfer – metal ions – Intra molecular reactions – Covalent catalysis – Catalysis by organized aggregates and phases. Inclusion complexation

UNIT V BIOORGANIC REACTIONS
Timing of Bond formation and fission – Acyl group transfer – C-C bond formation and fission – Catalysis of proton transfer reactions – Transfer of hydride ion – Alkyl group. Transfer – Terpene biosynthesis – Merrifield state peptide synthesis – Sanger method for peptide and DNA sequencing

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the students will be able to:
- CO1: define and appraise Bonding and stereochemistry
- CO2: classify and solve Mechanisms of substitution and addition reactions
CO3: discuss and formulate the Thermodynamics, kinetics and mechanism
CO4: describe and demonstrate Catalysis
CO5: classify and analyze Bioorganic reactions & mechanisms

TEXT BOOKS:

REFERENCES:

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

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.  

**TEXT BOOKS:**  

**REFERENCE BOOKS:**  
6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st
GE3251

OBJECTIVES:

**Objective I**

3

**Objective II**

3

**Objective III**

3

**Objective IV**

3
TEXT-CUM-REFERENCE BOOKS
1. தமிழக வரலை – மக்களும் பண பொடும் – மகமாயனை பல்லவராயன் மக்களும் பண பொடும் பல்லவராயன் கல்வியியல் (தொல்லியல்: தமிழில் பல்லவராயன் பல்லவராயன் கல்வியியல் குருதம்).
2. கரைநிகழ்வு குழுமா – மெல்லானை காமிகரு (தொல்லியல் புதியாயன்).
3. சிற்பம் – தமிழக வரலைவியல் வரலைவியல் குருதம் காமிகரு (தொல்லியல் பல்லவராயன் குருதம் காமிகரு).
4. பொருளரிழாதி – அனுபவதான திருத்தகம். (தொல்லியல் குருதம் காமிகரு).
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 Bookand Educational Services Corporation, Tamil Nadu)

GE3251 TAMILS AND TECHNOLOGY

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in 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 - Conch diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3
Development of Scientific Tamil - Tamil computing - Digitalization of Tamil Books - Development of Tamil Software - Tamil Virtual Academy - Tamil Digital Library - Online Tamil Dictionaries - Sorkuvai Project.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS
1. தமிழகவரலொறு – மக்களும் பண் பொடும் – மக.மக.பிள்மள (விவசாயின்:தமிழெழுத்தாளர் பரந்தர் பண்டையில் பல்கலைக் கழகம்).
2. கலி விழா தொடர் – மக்களும் மிதியர் குடியரசு (விவசாயின்:பிரிகுறும்).
3. கி.பு. – கையாண் தூர்களால் குத்திபனா நகர் தாரங்கம் (கையாண் பெண் குத்திபனா நகர்).
4. பி.மு. – குறாம்விழா தாரங்கம் (கையாண் பெண் குத்திபனா நகர்).
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NCC Credit Course Level 1*
NX3251 (ARMY WING) NCC Credit Course Level - I

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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, 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
NCC Credit Course Level 1*

NX3253 (AIR FORCE WING) NCC Credit Course Level – I

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

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

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

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

SOCIAL SERVICE AND COMMUNITY DEVELOPMENT
SS 1 Basics, Rural Development Programmes, NGOs, Contribution of Youth
SS 4 Protection of Children and Women Safety
SS 5 Road / Rail Travel Safety
SS 6 New Initiatives
SS 7 Cyber and Mobile Security Awareness

TOTAL : 30 PERIODS

IB3211 BIOORGANIC CHEMISTRY LABORATORY

OBJECTIVES
• make the students understand the mechanism of synthesis of different chemical moieties
• familiarise the students with the isolation of biomolecules from natural sources

LIST OF EXPERIMENTS
1. Synthesis of aspirin
2. Hydrolysis of sucrose
3. Preparation of Glycine
4. PI of Glycine
5. Precipitation of protein
6. Extraction of lycopene
7. Esterification
8. Preparation of acetate buffer
9. Preparation of different molar concentrations of acetic acid and hydrochloric acid
10. Preparation of 5,10,15,20-tetrakisphenylporphyrin

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, the students will be able to:
- CO1: recognize and illustrate the mechanism of reactions
- CO2: be able to analyze and formulate various Bioorganic compounds
- CO3: be able to demonstrate and work independently for the experimentation.

REFERENCES:

Course Articulation Matrix

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Course 1-low, 2-medium, 3-high, “-“- no correlation

PH3161 PHYSICS LABORATORY L T P C
0 0 2 1

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

Any SEVEN Experiments
1. Torsional Pendulum-Determination of rigidity modulus of wire and moment of inertia of the disc
2. Non-uniform bending - Determination of Young’s modulus of the material of the beam.
3. Uniform bending – Determination of Young’s modulus of the material of the beam.
4. Lee’s Disc Experiment - Determination of thermal conductivity of bad conductors.
5. Viscosity of Liquids.
6. Acoustic Grating-Determination of the velocity of ultrasonic waves in liquids.
7. Ultrasonic interferometer – determination of sound velocity and liquids compressibility
8. Laser - Determination of the wavelength of the laser using grating
   - Determination of the width of the groove of the compact disc using laser.
   - Estimation of laser parameters.
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**

**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.

**Course Articulation Matrix**

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

**GE3261 ENGLISH LABORATORY- II**

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**OBJECTIVES:**

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

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

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

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

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

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

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

TOTAL: 30 PERIODS

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

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<td>3 1 2 2 2 1 3 3 3 3 3 2 3</td>
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<td>5 - - - - - - - - - - - -</td>
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<tr>
<td>Overall CO 1.3 2 2 2 1.3 3 3 3 3 1.6 3</td>
</tr>
</tbody>
</table>

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