DEPARTMENT OF BIOTECHNOLOGY
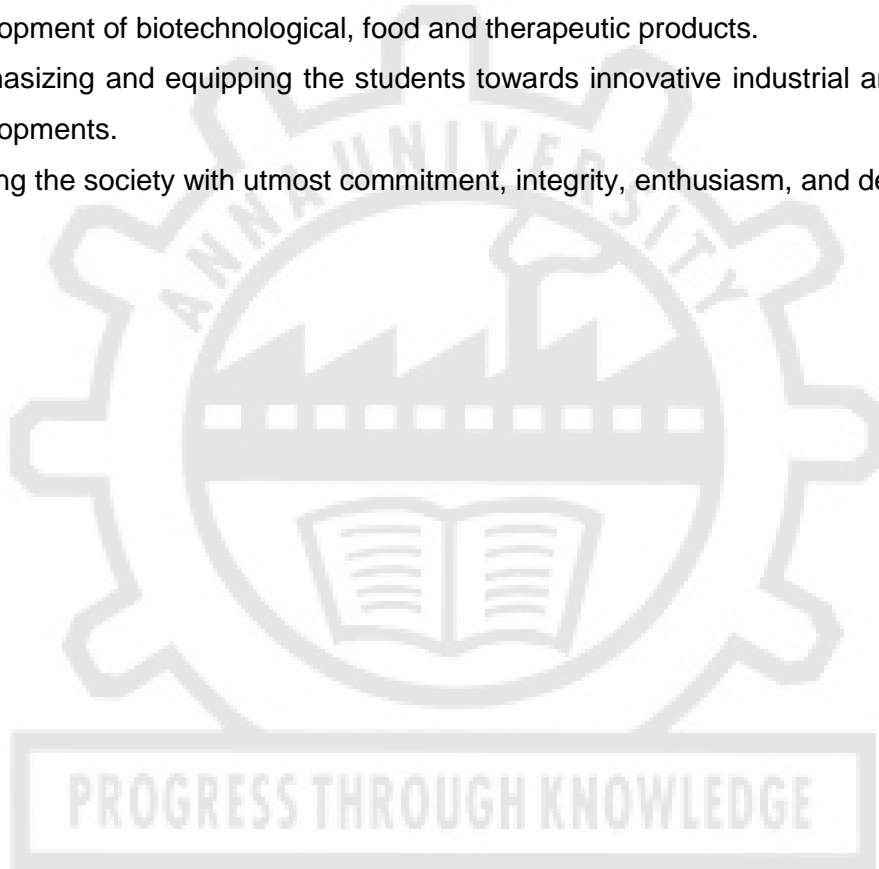## ANNA UNIVERSITY, CHENNAI

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.

ANNA UNIVERSITY, CHENNAI: 600 025

UNIVERSITY DEPARTMENTS

REGULATIONS - 2023

CHOICE BASED CREDIT SYSTEM

B.TECH. INDUSTRIAL BIOTECHNOLOGY

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
4.

2. Program Outcomes (POs)

PO#	Graduate Attribute
1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**: 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.
4	**Conduct investigations of complex problems**: 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.
5	**Modern tool usage**: 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.
6	**The engineer and society**: 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.
7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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

PEO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	3	3	1	1	1	1	1	1	2	3	2	1
2	1	1	2	2	2	3	1	2	3	3	2	2	2	3	2
3	2	2	3	2	1	3	3	2	1	2	2	3	2	2	2

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

S.NO.	CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS3151	English for communication -I	HSMC	3	0	0	3	3
2.	MA3151	Matrices and Calculus	BSC	3	1	0	4	4
3.	PH3151	Engineering Physics	BSC	3	0	0	3	3
4.	CY3151	Engineering Chemistry	BSC	3	0	0	3	3
5.	GE3152	Problem Solving and Python Programming	ESC	2	0	4	6	4
6.	GE3154	தமிழர்மரபு/Heritage of Tamils	HSMC	1	0	0	1	1
PRACTICALS								
7.	CY3161	Chemistry Laboratory	BSC	0	0	2	2	1
8.	GE3162	English Laboratory - I$	EEC	0	0	2	2	1
			TOTAL	**15**	**1**	**8**	**24**	**20**

$ Skill Based Course

SEMESTER – II

S.NO.	CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS3251	English for communication – II	HSMC	3	0	0	3	3
2.	MA3251	Ordinary Differential Equations And Transform Techniques	BSC	3	1	0	4	4
3.	IB3251	Bioorganic chemistry	BSC	3	0	0	3	3
4.	GE3153	Programming in C	ESC	2	0	4	6	4
5.	GE3251	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	1	1
6.		NCC Credit Course Level I#	-	2	0	0	2	2#
PRACTICALS								
7.	IB3211	Bioorganic Chemistry Laboratory	BSC	0	0	4	4	2
8.	PH3161	Physics Laboratory	BSC	0	0	2	2	1
9.	GE3261	English Laboratory - II$	EEC	0	0	2	2	1
			TOTAL	**12**	**1**	**12**	**25**	**19**

#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.
$ Skill Based Course.

HS3151   **ENGLISH FOR COMMUNICATION -I**   **L T P C**
                                                                                  3 0 0 3

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

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

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

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

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

Assessment

Two Written Assessments: 35% weightage each

Assignment: 30% weightage

Designing a tourist brochure / Writing an opinion article / Making a travel podcast

End Semester Exam: 3-hour written exam

                                                              TOTAL : 45 PERIODS

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
2. "English for Science & Technology - I" by Cambridge University Press, 2023

REFERENCES
1. "Interchange" by Jack C.Richards, Fifth Edition, Cambridge University Press, 2017.
2. "English for Academic Correspondence and Socializing" by Adrian Wallwork, Springer, 2011.
3. "The Study Skills Handbook" by Stella Cortrell, Red Globe Press, 2019
4. www.uefap.com

CO-PO Mapping

CO	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	1	1	1	1	1	1	1	1	2	3	1	2
2	2	3	2	3	2	3	3	3	3	3	2	3
3	2	2	2	2	2	2	2	2	2	3	2	3
4	3	3	3	3	2	3	3	3	3	3	2	3
5	3	3	3	3	2	3	3	3	3	3	2	3
AVg.	2.2	2.4	2.2	2.4	1.8	2.4	2.4	2.4	2.6	3	1.8	2.8

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

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

UNIT II   FUNCTIONS OF SEVERAL VARIABLES   9 + 3
Limit, continuity, partial derivatives – Homogeneous functions and Euler's theorem - Total derivative – Differentiation of implicit functions - Taylor's formula for two variables - Errors and approximations – Maxima and Minima of functions of two variables – Lagrange's method of undermined multipliers.

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

UNIT IV   MULTIPLE INTEGRALS   9+ 3
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals.

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

TOTAL: 60 PERIODS

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
1. Joel Hass, Christopher Heil, Maurice D.Weir "'Thomas' Calculus", Pearson Education., New Delhi, 2018.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
3. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, 6th Edition, New Delhi,2013.

REFERENCE BOOKS
1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015.
2. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5 th Edition, New Delhi, 2017.
4. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012.
6. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	1	2	-	-	-	-	-	3
CO2	3	2	-	1	1	2	-	-	-	-	-	3
CO3	3	2	-	1	1	2	-	-	-	-	-	3
CO4	3	2	-	1	1	2	-	-	-	-	-	3
CO5	3	2	-	1	1	2	-	-	-	-	-	3
AVg.	3	2		1	1	2						3

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

PH3151   **ENGINEERING PHYSICS**   **L T P C**
                                                               3 0 0 3

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   9
Rigid Body – Centre of mass – Rotational Energy - Moment of inertia (M.I)- Moment of Inertia for uniform objects with various geometrical shapes. Elasticity –Hooke's law - Poisson's ratio - stress-strain diagram for ductile and brittle materials – uses- Bending of beams – Cantilever - Simply supported beams - uniform and non-uniform bending - Young's modulus determination - I shaped girders –Twisting couple – Shafts. Viscosity – Viscous drag – Surface Tension.

UNIT II   OSCILLATIONS, SOUND AND THERMAL PHYSICS   9
Simple harmonic motion - Torsional pendulum –- Damped oscillations –Shock Absorber - Forced oscillations and Resonance –Applications of resonance. - Waves and Energy Transport –Sound waves – Intensity level – Standing Waves - Doppler effect and its applications - Speed of blood flow. Ultrasound – applications - Echolocation and Medical Imaging. Thermal Expansion – Expansion joints – Bimetallic strip – Seebeck effect – thermocouple -Heat Transfer Rate – Conduction – Convection and Radiation.

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 - polarizers -– Laser – characteristics – Spontaneous and Stimulated emission-population – inversion - Metastable states - optical feedback - Nd-YAG laser, CO_2 laser, Semiconductor laser - Industrial and medical applications - Optical Fibers – Total internal reflection – Numerical aperture and acceptance angle – Fiber optic communication – Fiber sensors – Fiber lasers.

UNIT IV   QUANTUM MECHANICS   9
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   9
Crystal Bonding – Ionic – covalent – metallic and van der Walls's/ molecular bonding. Crystal systems - unit cell, Bravais lattices, Miller indices - Crystal structures - atomic packing density of BCC, FCC and HCP structures. NaCl, Diamond, Graphite, Graphene, Zincblende and Wurtzite structures - crystal imperfections- point defects - edge and screw dislocations – grain boundaries. Crystal Growth – Czocharalski method – vapor phase epitaxy – Molecular beam epitaxy- Introduction to X-Ray Diffractometer.
                                                        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:
1. Raymond A. Serway, John W. Jewett, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2013.
2. D. Halliday, R. Resnick and J. Walker, Principles of Physics. John Wiley & Sons, 10th Edition, 2015.
3. N. Garcia, A. Damask and S. Schwarz, Physics for Computer Science Students, Springer-Verlag, 2012.
4. Alan Giambattista, Betty McCarthy Richardson and Robert C. Richardson, College Physics, McGraw-Hill Higher Education, 2012.

REFERENCE BOOKS:
1. R. Wolfson, Essential University Physics. Volume 1 & 2. Pearson, 2016.
2. D. Kleppner and R. Kolenkow. An Introduction to Mechanics, McGraw Hill Education, 2017.
3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications. Springer, 2012

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1							
CO2	2	2	1	2	1							
CO3	2	2	2	2	1							
CO4	2	1	1	1	1							
CO5	2	2	2	2	1							

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

CY3151   **ENGINEERING CHEMISTRY**   **L T P C**
                                                                   3 0 0 3
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   9
Introduction: Functionality-degree of polymerization. Classification of polymers (Source, Structure, Synthesis and Intermolecular forces). Mechanism of free radical addition polymerization. Properties of polymers: Tg, tacticity, molecular weight-number average, weight average, viscosity average and polydispersity index (Problems). Techniques of polymerization: Bulk, emulsion, solution and suspension.
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

Electrochemical cell, redox reaction, electrode potential - oxidation and reduction potential. Measurement and its application Introduction to corrosion - chemical and electrochemical corrosions-mechanism of electrochemical and galvanic corrosions-concentration cell corrosion-passivity-soil, pitting, inter-granular, water line, stress and microbiological corrosions-galvanic series-factors influencing corrosion- measurement of corrosion rate. Corrosion control-material selection and design-electrochemical protection- sacrificial anodic protection and impressed current cathodic protection. Protective coatings-metallic coatings (galvanizing, tinning), organic coatings (paints). Paints: Constituents and functions.

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) – H_2-O_2 fuel cell - Supercapacitors-Types and Applications, Renewable Energy: Solar- solar cells, DSSC

UNIT V   WATER TECHNOLOGY   9

Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD, BOD and heavy metals. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming. Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - demineralization. Municipal water treatment (screening, sedimentation, coagulation, filtration and disinfection-ozonolysis, UV treatment, chlorination), Reverse Osmosis.

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:

1.   Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2.   Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3.   Dara S.S., "A Text book of Engineering Chemistry", Chand Publications, 2004.

REFERENCES:
1. Schdeva M.V., "Basics of Nano Chemistry", Anmol Publications Pvt Ltd, 2011.
2. Friedrich Emich, "Engineering Chemistry", Medtech, 2014.
3. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science" New AGE International Publishers, 2009.

CO - PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2									
CO2	2	1		2	2							
CO3	2	2	1	1	2							
CO4	2		2		2							
CO5	3	2	2	1	1							
Avg	2	1	1	1	2	-	-	-	-	-	-	-

- 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**

Architecture of Computer – Program design: Algorithm - Pseudocode and flow chart–Interpreter – Introduction to Python Specification - Data Representation: Simple statements: Variables and Identifiers – Object Types - Operators - Expressions and its evaluation

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**

Conditional statements: if- if else – if elif – Nested conditional statements. Repetitive statements: while – for – Nested repetitive statements. Branching statement: break – continue – pass. Functions - Defining functions – Argument types – Scope and namespaces - Recursive functions – Lambda functions – Functions as arguments

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

String literals – String methods – String formatting expressions. Lists – Lists iteration and operations - Lists as stacks and queues – List comprehensions – Nested List comprehensions – Matrix operations using Lists - Tuples and sequences – Tuple iteration and operations

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

Sets – Set iteration and operations - Dictionaries – Dictionary iteration and operations - Dictionary comprehensions - Nested Dictionary comprehensions. Functional programming tools (map, filter, reduce) – Modules – import and from statements- Executing modules as scripts – Standard modules & Packages, creation of module/package

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

Errors: Syntax and logical errors – Exceptions: Exception types - Handling exceptions - Multiple exceptions and handlers – Raising exceptions. Files: File Path - Type of files - opening modes - Reading and Writing files. Handling Data files.

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: 90 (30+60) PERIODS

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

1. Reema Thareja, Python Programming using Problem Solving Approach, Oxford University Press, First Edition, 2017.
2. S. Sridhar, J. Indumathi, V. M. Hariharan, Python Programming, Pearson Education, First Edition, 2023

REFERENCE BOOKS

1. Paul Deitel, Harvey Deitel, Python for Programmers, Pearson Education, 2020.
2. John V Guttag. Introduction to Computation and Programming Using Python, With Application to Computational Modeling and Understanding Data. Third Edition, The MIT Press, 2021

3. Mark Lutz, Learning Python, 5th Edition, O'Reilly Media, Inc.
4. Python official documentation and tutorial, https://docs.python.org/3/

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	2	-	-	-	-	-	-	-	1
CO2	1	3	3	2	-		-	-	-	-	-	1
CO3	1	2	3	2	-	-	-	-	-	-	-	1
CO4	1	2	3	2	-	-	-	-	-	-	1	1
CO5	1	2	3	2	1	1	-	-	-	2	1	1
Avg	1	2.4	2.8	2	0.2	0.2	-	-	-	0.4	0.4	1

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

GE3154   **தமிழர் மரபு**   **L T P C**
                                                                       1 0 0 1

அலகு I: மொழி மற்றும் இலக்கியம்   **3**
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு
செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச்
சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில்
மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண
பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும்
நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின்
வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன்
ஆகியோரின் பங்களிப்பு.

அலகு II: மரபு – பாறை ஓவியங்கள் முதல் நவீன   **3**
ஓவியங்கள் வரை – சிற்பக் கலை:
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்–
பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள்,
பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத்
தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் –
மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக
பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III: நாட்டுப்புறக் கலைகள் மற்றும் வீர   **3**
விளையாட்டுகள்:
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம்,
தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்
விளையாட்டுகள்.

அலகு IV: தமிழர்களின் திணைக் கோட்பாடுகள்:   **3**
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும்
சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள்
போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும்,

கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL 15 HOURS

TEXT CUM REFERENCE BOOKS:
1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே·கே· பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)·
2. கணினித் தமிழ் – முனைவர் இல· சுந்தரம்· (விகடன் பிரசுரம்)·
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம்· (தொல்லியல் துறை வெளியீடு)
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)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

GE3154	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I : LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

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 & 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   3
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 HOURS

TEXT CUM REFERENCE BOOKS:
1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு   பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To estimate the corrosion resistance of metals by weight loss method and molecular weight of polymer by viscometry.

LIST OF EXPERIMENTS:
1. Estimation of HCl using 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.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Determination of Glass transition temperature of a polymer
10. Phase change in a solid.
11. Corrosion experiment-weight loss method.

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
1. Laboratory Manual - Department of Chemistry, CEGC, Anna University (2023).
2. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

CO - PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2			2		1			
CO2	2	1	2	1		2			1			
CO3	2	2	2	1	2				1			
CO4	1	1	1	1	1				1			
CO5	2	2	2	2	1	2			1			
Avg	2	2	2	1	1	2	2		1			

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

GE3162   **ENGLISH LABORATORY – I**   **L T P C**
                                                                   0 0 2 1

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												
CO's	**PO's**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	1	2	2	2	1	3	3	3	3	3	2	3
2	1	2	2	2	1	3	3	3	3	3	1	3
3	1	2	2	2	1	3	3	3	3	3	1	3
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
Overall CO	1	2	2	2	1	3	3	3	3	3	1.3	3

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

HS3251   **ENGLISH FOR COMMUNICATION -II**   **L   T   P   C**
                                                                         3   0   0   3

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; **Readin**g - 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
1. "English for Science & Technology" by Cambridge University Press, 2023.
2. "English for Engineers and Technologists" by Orient Blackswan, 2022.

REFERENCE BOOKS
1. "Communicative English for Engineers and Professionals" by Bhatnagar Nitin, Pearson India, 2010.
2. "Take Off – Technical English for Engineering" by David Morgan, Garnet Education, 2008.
3. "Advanced Communication Skills" by Mathew Richardson, Charlie Creative Lab, 2020.
4. www.uefap.com

CO's	PO's											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	1	3	3	3	1	3	3	3	3	3	2	3
2	2	3	2	3	2	3	3	3	3	3	2	3
3	2	2	2	2	2	2	2	2	2	3	2	3
4	1	1	1	1	1	1	1	1	1	3	1	3
5	3	3	3	3	2	3	3	3	3	3	2	3
Overall CO	1.8	2.4	2.4	2.4	1.6	2.4	2.4	2.4	2.4	3	1.8	3

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

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**
Homogeneous linear ordinary differential equations of second order, linearity principle, general solution- Particular integral - Operator method - Solution by variation of parameters - Method of undetermined coefficients - Homogenous equations of Euler–Cauchy and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

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
Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and final value theorems – Formation of difference equation – Solution of difference equation using Z - transform.

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
1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015.

REFERENCE BOOKS
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
3. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5 th Edition, New Delhi, 2017.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012.
5. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

COPO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	3	3	-	-	-	-	-	3
CO2	3	2	-	2	3	3	-	-	-	-	-	3
CO3	3	2	-	2	3	2	-	-	-	-	-	3
CO4	3	2	-	1	3	3	-	-	-	-	-	3
CO5	3	2	-	1	3	2	-	-	-	-	-	3

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

IB3251	BIOORGANIC CHEMISTRY	L TP C
		30 0 3

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   9

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   9

SN1and   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   9

Kinetic method – Rate law and mechanism – Transition states- Intermediates – Trapping of intermediates – Microscopic reversibility – Kinetic and thermodynamic reversibility – Isotopes for detecting intermediates. Primary and secondary isotopes – the Arrhenius equation Eyring equation ΔG, ΔS, ΔH, Thermodynamics of coupled reactions.

UNIT IV   CATALYSIS   9

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

UNIT V   BIOORGANIC REACTIONS   9

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:
1. Carey, Francis A." Organic Chemistry". VIIth Edition, Tata MCGraw Hill, 2009.
2. Page, M.I. and Andrew W illiams "Organic and Bio-organic Mechanisms". Pearson, 2010

REFERENCES:
1. Dugas, Hermann "Bioorganic Chemistry: A Chemical Approach to Enzyme Action" 3rd Edition, Springer, 2003.

Course Articulation Matrix

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	2	2	1	1	1	1	-	-	-	2	2	3	1
2	3	2	2	2	3	2	2	1	1	1	-	2	3	2	2
3	3	2	2	2	2	2	-	-	-	1	-	2	2	2	2
4	1	2	2	2	1	2	1	-	1	1	-	1	2	1	1
5	2	2	2	2	2	1	2	2	2	2	-	2	3	2	3
Overall CO	2.2	2	2	2	1.8	1.6	1.5	1.3	1.3	1.3	-	1.8	2.4	2	1.8

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

GE3153 **PROGRAMMING IN C** **L T P C**
2 0 4 4

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

Preprocessor directives – Simple and Conditional macros with and without parameters - Files - Types of file processing: Sequential and Random access – File operations – read, write & seek.

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:
1. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

REFERENCE BOOKS:
1. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
2. Ashok N Kamthane, Programming in C, Pearson, Third Edition, 2020
3. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
4. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C"' McGraw-Hill Education, 1996.
6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st

Edition, Pearson Education, 2013.

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

CO	PO1	PO2	PO3	PO4	POS	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	1	2	2	1	-	-	-	2	-	3
2	3		3	3	1	1	-	-	-	-	-	-
3	3	3	3	3	2	-	-	-	3	-	-	-
4	3	3	3	3	2	-	-	-	3	-	3	3
5	3	3	3	3	3	2	-	-	-	-	3	3
Avg	3	3	3	3	2	1	-	-	3	2	3	3

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

GE3251 தமிழரும் தொழில்நுட்பமும் **L T P C**
 1 0 0 1

OBJECTIVES:

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் **3**

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் **3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III உற்பத்தித் தொழில் நுட்பம் **3**

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம் **3**

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார்

24

சமூகம்.

அலகு V   <u>அறிவியல் தமிழ் மற்றும் கணித்தமிழ்</u>:   **3**
அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL: 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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 C ivilization 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)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

PROGRESS THROUGH KNOWLEDGE

GE3251   **TAMILS AND TECHNOLOGY**   **L   T   P   C**
                                                                            1   0   0   1

UNIT I   WEAVING AND CERAMIC TECHNOLOGY   **3**
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II   DESIGN AND CONSTRUCTION TECHNOLOGY   **3**
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

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

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

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. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
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)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

NCC Credit Course Level 1*

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, 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*
NX3252	**(NAVAL 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, 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   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, 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

IB3211   BIOORGANIC CHEMISTRY LABORATORY   L T P C
0 0 4 2

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:
1. Organic Chemistry, Francis A.Carey, VII Edition, Tata McGraw Hill, Fourth reprint 2009.
2. Organic and Bio-organic Mechanisms, M.I. Page and Andrew Williams. Pearson, First Impression, 2010.

Course Articulation Matrix

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	-	3	1	-	-	-	1	2	-	2	2	3	2
2	1	2	-	2	1	-	-	-	2	1	-	2	2	3	3
3	2	2	-	2	1	-	1	-	1	1	-	2	2	2	2
Overall CO	**1.7**	**2**	**-**	**2.3**	**1**	**-**	**1**	**-**	**1.3**	**1.3**	**-**	**2**	**2**	**2.7**	**2.3**

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
19. Hall effect – determination of Hall parameters.
20. Design LCR series and parallel circuit and estimation of the resonant frequency.
21. Magnetic Hysteresis Loop tracer – determination of magnetic parameters.
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												
CO's	**PO's**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	3	1	2	1					1		
2	2	2	1	2	1					1		
3	3	3	1	2	1					1		
4	2	1	1	2	1					1		
5	2	2	1	2	1					1		
Overall CO	3	3	1	2	1					1		

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

GE3261	**ENGLISH LABORATORY- II**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

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.

Course Articulation Matrix												
CO's	**PO's**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	2	2	2	2	2	3	3	3	3	3	2	3
2	1	2	2	2	1	3	3	3	3	3	1	3
3	1	2	2	2	1	3	3	3	3	3	2	3
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
Overall CO	1.3	2	2	2	1.3	3	3	3	3	3	1.6	3

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