CURRICULUM & SYLLABUS

(REGULATIONS 2023)

FOR

B.Tech. BIOTECHNOLOGY

CHOICE BASED CREDIT SYSTEM

(Applicable to the students admitted from the Academic Year 2024-25 onwards)

EASWARI ENGINEERING COLLEGE
(Autonomous Institution)
Bharathi Salai, Ramapuram, Chennai - 600 089

[A Unit of SRM Group of Educational Institutions, Approved by AICTE | Affiliated to Anna University, Chennai | NAAC Accredited 'A' Grade | 2(f) & 12(B) Status (UGC) | ISO 9001:2015 Certified | NBA Accredited Programmes | FIST Funded (DST) | SIRO Certified (DSIR)]

CONTENTS

S. No	Course Code	Course Title	Category	L	T	P	R	CREDITS	Internal / External %
		SEMESTER I							
THEORY									
1	231LEH101T	Technical English	HS	3	-	-	-	3	40 / 60
2	231MAB101T	Matrices and Calculus	BS	3	1	-	-	4	40 / 60
3	231PYB101T	Engineering Physics	BS	3	-	-	-	3	40 / 60
4	231CYB101T	Engineering Chemistry	BS	3	-	-	-	3	40 / 60
5	231GES101T	Engineering Graphics	ES	2	-	3	1	4	40 / 60
6	231GES105T	Basic Electrical, Electronics and Instrumentation Engineering	ES	3	-	-	-	3	40 / 60
7	231GEH101T	தமிழர்மரபு / Heritage of Tamils	HS	1	-	-	-	1	40 / 60
LABORATORY									
8	231PYB011L	Physics Laboratory	BS	-	-	2	-	1	60 / 40
9	231GES013L	Basic Electrical and Electronics Engineering Laboratory	ES	-	-	4	-	2	60 / 40
10	231GEH111L	Induction Training&	MC	-	-	2	-	0	-
		TOTAL CREDITS						**24**	**-**

& - Mandatory to complete the course

S.No	Course Code	Course Title	Category	L	T	P	R	CREDITS	Internal / External %
		SEMESTER II							
THEORY									
1	231LEH201T	Professional Communication	HS	3	-	-	-	3	40 / 60
2	231MAB201T	Advanced Calculus and Complex Analysis	BS	3	1	-	-	4	40 / 60
3	231BTC201T	Materials Science for Biotechnologists	PC	3	-	-	-	3	40 / 60
4	231BTC202T	Bioorganic Chemistry	PC	3	-	-	-	3	40 / 60
5	231GES201T	Python Programming	ES	2	-	-	-	2	40 / 60
6	231GEH201T	தமிழரும் தொழில்நுட்பமும்/Tamils and Technology	HS	1	-	-	-	1	40 / 60
LABORATORY									
7	231CYB011L	Chemistry Laboratory	BS	-	-	2	-	1	60 / 40
8	231GES011L	Basic Workshop Practice	ES	-	-	2	-	1	60 / 40
9	231BTC211L	Bioorganic Chemistry Laboratory	PC	-	-	3	1	2	60 / 40
10	231GES211L	Programming Laboratory through Python	ES	-	-	3	1	2	60 / 40
		TOTAL CREDITS						**22**	**-**

SYLLABUS OF
SEMESTER – I
COURSES

231LEH101T	TECHNICAL ENGLISH (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
Regulation - R23		3	0	0	0	3

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Maximum Marks – 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	Overall
3	40 %	60 %	-	45%	50%

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	To improve the communicative competence of learners
2.	To help learners use language effectively in academic /work contexts
3.	To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts
4.	To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays, and user manuals.
5.	To use language efficiently in expressing their opinions via various media.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		Bloom's level
CO1:	Listen and comprehend lectures and talks in their area of specialization successfully.	K1 &K2
CO2:	Speak appropriately and effectively in varied formal and informal contexts.	K4 & K3
CO3:	Read technical texts.	K2 & K5
CO4:	Write Letters, Paragraphs, Descriptions.	K6 & K5
CO5:	Speak convincingly and express opinions on technical topics.	K6 & K4
CO6:	Communicate effectively through emails and analyze issues, technical articles and involve in speed writing.	K3 & K4

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	1	-	-
CO2	-	-	-	-	-	-	-	-	1	2	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	1	-	1
CO6	-	-	-	-	-	-	-	-	1	-	-	-

3 — High: 2 - Medium: 1 — Low: '- '- No correlation

UNIT	TITLE	PERIODS
I		9

Listening: Active listening -Types – Barriers **Speaking**: Self – introduction and introducing others/ Short conversation in formal and informal contexts- **Reading:** skimming and scanning – Intensive and extensive reading -**Writing**-Developing an outline– Developing hints **Vocabulary development and Grammar**: Parts of speech – Word formation – One word substitution – Phrasal verbs.

UNIT	TITLE	PERIODS
II		9

Listening: Listening to Telephonic conversation – Etiquettes- Do's and Don'ts - **Speaking**: – Making technical and presentation- Presentation Do's and Don'ts - **Reading**: - Interpretative and critical levels of reading – **Writing** – Technical writing – letter (request/ permission/ complaint)- **Vocabulary and Grammar** –Tenses – Subject verb agreement –Pronoun (Possessive and Relative Pronoun)

UNIT	TITLE	PERIODS
III		9

Listening: Listening to longer technical talks - **Speaking**: Expressing opinions – one to one debate — **Reading**: Comprehension- Pre- reading- post- reading - **Writing**- Email writing — Etiquette- Instructions and Recommendations - **Vocabulary and Grammar**: Adverbs – prepositions - Degrees of comparison (Comparative Degree)

UNIT	TITLE	PERIODS
IV		9

Listening: Listening to speeches of formal and informal conversation and answer comprehension - **Speaking**: Sharing information of a personal kind – greeting- taking leave – routine action - Reading: Note making and summarizing – Paraphrasing -**Writing**-Writing a Paragraph – Paragraph Types **Vocabulary and Grammar**: If clause — Articles – Sequence words – collocation– Conjunction.

UNIT	TITLE	PERIODS
V		9

Listening: TED /INK talks — Note taking **Speaking**: Participating in group discussion — Do's and Don'ts **Reading:** Reading reviews, advertisement – Newspaper/ magazines / Short stories - **Writing:** Process and Product description **Vocabulary and Grammar:** – Figures of Speech– Embedded sentences — WH Questions / Yes/No questions / Question tag

TOTAL PERIODS:	**45**

TEXT BOOKS:

1.	V. Chellamal, Deepa Mary Francis, K.N Shoba, P.R Sujatha Priyadharsini, Veena Selvam English for science and Technology, Cambridge University Press and Assessment 2023

REFERENCE BOOKS:

1.	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2.	A Course Book on Technical English by Lakshmi Narayanan, Scitech Publications (India) Pvt. Ltd.
3.	English For Technical Communication (With CD) By Aysha Viswamohan, McGraw Hill Education, ISBN:0070264244.
4.	Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.
5.	Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.

WEBSITES:

1.	https://www.usingenglish.com
2.	http://grammarbook.com

JOURNALS:

1.	National Council for Teachers of English
2.	https://www2.ncte.org/resources/journals/college-english/

EXTENSIVE READER:

1.	Spencer Johnson, Who Moved My Cheese, Putnam Adult, 1998

COURSE DESIGNERS

1.	Dr.Samuel Dawson	HOD	Department of English
2.	Dr.Usha Menon	Professor	Department of English
3.	Ms.Jean Ida	Assistant Professor	Department of English
4.	Ms.Moby	Assistant Professor	Department of English
5.	Ms.Surya S	Assistant Professor	Department of English
6.	Dr.Rudhra T S	Assistant Professor	Department of English

Recommended by Board of Studies	Date: 12.10.2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231MAB101T	MATRICES AND CALCULUS	Periods per week				Credits
		L	T	P	R	
Regulation - R23	(Common to all branches of Engineering and Technology)	3	2	0	0	4

SCHEME OF EXAMINATION					
Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	Overall
3	40 %	60 %	-	45%	50%

PREREQUISITES:

Basic Knowledge of Matrices and Determinants, Differentiation

COURSE OBJECTIVES:

1.	To reduce quadratic form to canonical form of a matrix and identify its nature
2.	To analyze the convergence of infinite series
3.	To study the concept of evolutes and envelopes
4.	To find the extreme values for a function of two variables
5.	To solve Differential Equations using different techniques

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		Bloom's level
CO1:	Reduce quadratic form to canonical form by orthogonal transformation and identify the nature of the quadratic form	K2, K3
CO2:	Analyze the convergence of a given infinite series	K3, K2
CO3:	Find evolute of a given curve and envelope of family of curves	K1, K2
CO4:	Find the extreme of function of two variables	K2, K3
CO5:	Solve Differential Equations using different techniques	K1, K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 — High: 2 - Medium: 1 — Low   : ,,-,, - No correlation

UNIT	TITLE	PERIODS
I	**MATRICES**	9+3

Characteristic equation – Eigen values and Eigenvectors of a real matrix – Properties of Eigen- values and Eigen-vectors, Cayley-Hamilton Theorem – statement and applications, Diagonalization of matrices by orthogonal transformation - Quadratic form – Reduction of a quadratic form to canonical form by Orthogonal transformation – Nature of quadratic forms

UNIT	TITLE	PERIODS
II	**SEQUENCES AND SERIES**	9+3

Sequences – Definition and examples, Series – Types of Convergence, Series of positive terms, Tests of convergence – Comparison test, Integral test and D'Alembert's ratio test, Alternating series – Leibnitz's test.

UNIT	TITLE	PERIODS
III	**APPLICATIONS OF DIFFERENTIAL CALCULUS**	9+3

Curvature, radius of curvature – Cartesian and parametric co-ordinates – Centre of curvature – Circle of curvature in Cartesian form, Evolutes, Envelopes, Evolute as envelope of normal.

UNIT	TITLE	PERIODS
IV	**FUNCTIONS OF SEVERAL VARIABLES**	9+3

Partial derivatives – Total derivative – Differentiation of implicit functions – Jacobian and its properties — Taylor's series for functions of two variables — Maxima and minima of functions of two variables –Lagrange's method of undetermined multipliers.

UNIT	TITLE	PERIODS
V	**ORDINARY DIFFERENTIAL EQUATIONS**	9+3

Solution of second and higher order linear differential equation with constants coefficients (Particular integrals involving $f(x) = e^{mx}, \sin mx, \cos mx, x^m, e^{mx} f(x)$). Euler's and Legendre's methods of solving Linear differential equations with variable coefficients, Method of variation of parameters.

TOTAL PERIODS:	60

TEXT BOOKS:	
1.	Joel Hass, Christopher Heil, and Maurice D. Weir "Thomas" Calculus", 14th Edition, Pearson.
2.	Grewal. B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018
3.	Work-Book on " Matrices and Calculus", Chess Educational Publishers, prepared by Department of Mathematics

REFERENCE BOOKS:

1.	Bali N P, Manish Goyal, "A Textbook of Engineering Mathematics", Ninth Edition, Laxmi Publications Pvt Ltd, 2016.
2.	James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015
3.	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
4.	Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016

WEBSITES:

1.	www.pearsoned.co.in/georgebthomasjr
2.	www.cengage.com/international
3.	https://onlinecourses.nptel.ac.in/noc21_ma58/unit?unit=1&lesson=2

COURSE DESIGNERS

1.	Dr.S.Muthukumar	Professor	Department of Mathematics
2.	Dr.S.R.Ananthalakshmi	Associate Professor & HOD	Department of Mathematics
3.	Dr.K.S.Vidhyaa	Assistant Professor (Sr.G)	Department of Mathematics

Recommended by Board of Studies	Date: 12-10-2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231PYB101T	ENGINEERING PHYSICS	Periods per week				Credits
	(Common to all branches of Engineering and Technology)	L	T	P	R	
Regulations - R23		3	0	0	0	3

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Maximum Marks – 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	
3	40 %	60 %	-	45%	50%

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	To impart knowledge on the basic principle of mechanics.
2.	To enable the students to gain knowledge on thermal physics.
3.	To explain the application of ultrasonics devices in engineering and medicine.
4.	To teach the description of various crystal structures and crystal defects for industrial applications.
5.	To learn the importance of laser and optical fibers for industry, telecommunication, and medical applications.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	Bloom's level
CO1: Apply the basic principle of dynamics in torsional pendulum.	K3
CO2: Calculate the thermal conductivity in real life thermal appliances.	K4
CO3: Apply the concept of ultrasonics for engineering and medical disciplines.	K3
CO4: Analyze the crystal structures and crystal defects for industrial applications.	K4
CO5: Select the appropriate laser and optical fibers for industry, telecommunication, and medical applications.	K4

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

CO5	3	2	1	-	-	-	-	-	-	-	-	1

3 — High: 2 - Medium: 1 — Low   : '-'– No correlation

UNIT I	MECHANICS	9

Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M.I – moment of inertia of uniform rod, circular disc, solid cylinder – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – gyroscope – Torsional pendulum.

UNIT II	THERMAL PHYSICS	9

Fundamentals of thermal energy - Expansion joints - Bimetallic strips - Thermal conductivity, conductions in solids, Determination of thermal conductivity- Forbe's and Lee 's disc method - Conduction through compound media – Thermal insulation – thermal shock resistance - Applications: Solar water heater- tempered glass- cryogenic materials.

UNIT III	SOUND WAVES AND VIBRATIONS	9

Propagation, Intensity, Loudness of sound waves — Determination of absorption coefficient, Reverberation, Sabine's formula for reverberation time - Factors affecting acoustics of buildings and their remedies - Ultrasonic waves and properties, Methods of Ultrasonic production, Applications of Ultrasonic in engineering and medicine.

UNIT IV	CRYSTAL PHYSICS	9

Single crystalline, polycrystalline, and amorphous materials — single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP, and diamond structures - crystal imperfections: point defects, line defects — Burger vectors, stacking faults.

UNIT V	APPLIED OPTICS	9

Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion – He-Ne laser, CO_2 laser, Semiconductor laser – Basic applications of lasers in industry. Principle and propagation of light in optical fibre, Derivation for Numerical aperture, and Acceptance angle - Types and losses of optical fibre - Fibre Optical Communication (Block diagram)
– Fibre Optic Endoscope.

TOTAL PERIODS:	45

TEXT BOOKS:

1.	R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Pub., 2018.
2.	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.
3.	D.Kleppner and R. Kolenkow, An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.

REFERENCE BOOKS:

1.	Jeff Sanny, Samuel J. Ling, and William Moebs, University Physics, Volume 1- 3, OpenStax, ISBN-13: 978-1-947172-15-9, 2023.
2.	Halliday, R. Resnick, and J. Walker. Principles of Physics, Wiley (Indian Edition), 2015.
3.	Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
4.	D.K. Bhattacharya & T. Poonam, Engineering Physics, Oxford University Press, 2015.
5.	V. Rajendran, Engineering Physics, McGraw Hill Publication, 2017.

WEBSITES:

1.	https://www.britannica.com/technology/laser/Laser-applications
2.	https://en.wikipedia.org/wiki/Crystal_structure

COURSE DESIGNERS

1.	Dr. S. Nirmala	Assoc Professor & Head	Department of Physics
2.	Dr. G. Rajkumar	Professor	Department of Physics
3.	Dr. R. Sivakumar	Asst Professor	Department of Physics
4.	Dr. K. Raju	Asst Professor	Department of Physics

Recommended by Board of Studies	Date: 12-10-2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231CYB101T	ENGINEERING CHEMISTRY (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
Regulation - R23		3	0	0	0	3

SCHEME OF EXAMINATION					
Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	
3	40 %	60 %	-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To explain water quality parameters and water treatment techniques
2.	To know about the polymers and polymer reinforced composites
3.	To gain knowledge about the types and applications of fuels
4.	To learn about various energy resources and storage devices
5.	To impart knowledge about the nanomaterial's synthesis, properties, and applications

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Identify an appropriate water treatment technique for the given water sample	K4
CO2:	Choose an appropriate method for polymer synthesis and for fabrication of plastics.	K3
CO3:	Select a suitable fuel for given application, based on the combustion characteristics of fuel.	K3
CO4:	Construct the device for electricity generation from available energy.	K3
CO5:	Synthesize the nanomaterials for a given application	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 — High: 2 - Medium: 1 — Low   : ' - '– No correlation

UNIT	TITLE	PERIODS
I	**WATER AND ITS TREATMENT**	**9**

Introduction- types of impurities in water - water quality parameters: definition and significance of colour, odour, turbidity, pH, hardness, alkalinity, dissolved oxygen, chloride, and fluoride - alkalinity
- types and determination - hardness - types only - boiler feed water- requirements-boiler troubles
- scale & sludge — disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) - softening of hard water - external treatment process - demineralization and zeolite, internal treatment
- boiler compounds (phosphate, Calgon, carbonate and colloidal conditioning methods) — desalination of brackish water -reverse osmosis.

UNIT	TITLE	PERIODS
II	**POLYMERS AND FRP COMPOSITES**	**9**

Introduction- classification of polymers - natural and synthetic - thermoplastic and thermosetting, functionality — degree of polymerization, types - addition and condensation polymerization - free radical polymerization mechanism - preparation, properties and uses of PVC, Nylon 6,6, Teflon, and Epoxy resin. Plastics - Compounding of plastics - moulding methods -injection, extrusion, and compression — composites - definition, FRP composites

UNIT	TITLE	PERIODS
III	**FUELS AND COMBUSTION**	**9**

Classification - coal - proximate and ultimate analysis — carbonization - metallurgical coke - manufacture by Otto Hoffmann method - petroleum - refining - cracking -synthetic petrol by Bergius process — knocking in petrol and diesel engines- octane and cetane rating of fuels - synthesis - advantages and commercial application of alternate fuels (power alcohol, biodiesel and cryogenic fuel) - gaseous fuels - liquefied petroleum gases (LPG)- compressed natural gas (CNG) - Combustion of fuels: introduction - calorific value - higher & lower- theoretical calculation – flue gas analysis by Orsat method.

UNIT	TITLE	PERIODS
IV	**ENERGY SOURCES AND STORAGE DEVICES**	**9**

Energy - types - non-renewable energy - nuclear energy - fission and fusion reactions - differences between nuclear fission and fusion - nuclear chain reactions - light water nuclear reactor for power generation - breeder reactor - renewable energy - solar energy conversion - principle, working and applications of solar cells; recent developments in solar cell materials, Batteries - types of batteries - characteristics - construction and working of primary battery (dry cell) - secondary battery (lead acid battery and lithium-ion-battery), electric vehicles - working principles - fuel cells (H_2-O_2)

UNIT	TITLE	PERIODS
V	**NANO CHEMISTRY AND GREEN NANOTECHNOLOGY**	**9**

Introduction of Nano materials - distinction between nanoparticles, molecules, and bulk materials – properties of nanomaterials - size dependent properties - synthesis – bottom-up methods - precipitation, thermolysis (hydrothermal & solvothermal) - top-down methods - electro-deposition, chemical vapour deposition, laser ablation — types of nanoparticles: nano cluster, nano-rod, nano- wire and nano-tube - carbon nano tube (synthesis and properties) - applications of nanoparticles. Green nanotechnology - nanotechnology products as potential substitutes for harmful chemicals, environmental concerns with nanotechnology

TOTAL PERIODS:		**45**

TEXT BOOKS:

1.	Kannan P and Ravikrishnan A, - Engineering Chemistry, Sri Krishna, Hitech publishing Company Pvt. Ltd, 2023.
2.	Jain P.C. and Monika Jain, - Engineering Chemistry, Dhanpat Rai, Publishing Company (P) Ltd., New Delhi, 2018.
3.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.

REFERENCE BOOKS:

1.	Dara S. S & S. S Umare, - A Text book of Engineering Chemistry‖, S. Chand & Company Ltd., New Delhi, 2018.
2.	Palanna O.G, ―Engineering Chemistry‖, McGraw Hill Education (India)Pvt. Ltd, 2nd Edition, 2017.
3.	Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2nd Edition, 2019.

WEBSITES:

1.	https://www.brainkart.com/subject/Engineering-Chemistry_264/
2.	https://www.poriyaan.in/paper/engineering-chemistry-4

JOURNALS:

1.	Journal of water technology and treatment methods
2.	Journal of polymers and composites
3.	Fuel and combustion scientific and research journal
4.	Journal of renewable and sustainable energy
5.	Journal of nanomaterials

EXTENSIVE READER:

1.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath, and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2.	Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
3.	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

COURSE DESIGNERS

1.	Dr. C. Ravichandran	Professor	Chemistry
2.	Dr. V. Vanitha	Assistant Professor	Chemistry
3.	Dr. K. Saravanan	Associate Professor	Chemistry

Recommended by Board of Studies	Date: 12-10-2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231GES101T	ENGINEERING GRAPHICS (Common to MECH, CIVIL, BME, AUTO, RA)	Periods per week				Credits
		L	T	P	R	
Regulation - R23		2	0	4	0	4

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	
3	40 %	60 %	-	45%	50%

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	To develop student's graphic skills for communication of concepts, ideas, and design of engineering products.
2.	To expose them to existing National standards related to technical drawings.
3.	To Familiarize with basic geometrical constructions and orthographic projections.
4.	To make the students to draw the different projections of the solids.
5.	To draw the true shape and apparent shape of the sectioned solids and their developments.
6.	To draw 3D views through isometric projections.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	Bloom's level
CO1: Construct conic sections and cycloids	K3
CO2: Draw the projections of points, Straight lines and planes inclined to both the principal planes.	K3
CO3: Draw the projections of the simple solids like cylinder, cone, prisms and pyramids inclined to one of the principal planes.	K3
CO4: Draw the sectional views of simple solids, obtain true shape and develop the sectioned solids.	K3
CO5: Construct Orthographic views from pictorial views using drawing instruments and AutoCAD	K3
CO6: Draw the isometric view and isometric projection of simple and truncated solids in vertical position using drawing instruments and AutoCAD.	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	1	-	1	2	2	-	1
CO2	3	3	2	-	-	1	-	1	2	2	-	1
CO3	3	3	2	-	-	1	-	1	2	2	-	1
CO4	3	3	2	-	-	1	-	1	2	2	-	1
CO5	3	3	2	-	3	1	-	1	2	2	-	1
CO6	3	3	2	-	3	1	-	1	2	2	-	1

3 — High: 2 - Medium: 1 — Low   : '- - No correlation

UNIT	TITLE	PERIODS
0	CONCEPTS AND CONVENTIONS USED (Not for Examination)	2

Principles of Engineering graphics and their significance - Use Of drawing Instruments-BIS conventions and specifications-Size, Layout and folding of drawing sheets-Lettering and Dimensioning.

UNIT	TITLE	PERIODS
I	PLANE CURVES, PROJECTION OF POINTS	06 + 11

Conic Sections - Construction of Ellipse, Parabola & hyperbola by eccentricity method – Construction of cycloid – Introduction to Scales. Introduction of Orthographic projection - Principal planes - First angle projection - projection of points

UNIT	TITLE	PERIODS
II	PROJECTION OF LINES AND PLANES	06 + 11

Projection of straight lines inclined to both the principal planes by rotating line method. Projection of simple planes inclined to both the principal planes by rotating object method. Projection of simple solids like Prism, Pyramid, Cylinder and Cone when the axis is inclined to one of the principal planes by rotating object method

UNIT	TITLE	PERIODS
III	PROJECTION OF SOLIDS	06 + 11

Projection of simple solids like Prism, Pyramid, Cylinder & Cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT	TITLE	PERIODS
IV	SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	06 + 11

Sectioning of simple solids (Prism, Pyramid, Cylinder & Cone) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of surfaces of right regular and sectioned solids

UNIT	TITLE	PERIODS
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS**	06 + 11

Principles of Isometric Projections-Isometric scale- Isometric Views of simple and truncated solids — combination of two solid objects in simple vertical positions. Conversion of Isometric views to Orthographic views of the objects. Introduction to perspective projections.

UNIT	TITLE	PERIODS
VI	**COMPUTER AIDED DRAFTING: (Demonstration Only, Not for Exam)**	3

The Concepts of Computer Aided Drafting for Engineering drawing, Computer graphics & Geometrical modeling (2D Orthographic Views) and 3D drafting (Isometric Views) using AutoCAD.

TOTAL PERIODS:	90

TEXT BOOKS:

1.	Bhatt N.D. and Panchal V.M., "Engineering Drawing" Charotar Publishing House, 50th Edition, 2010.
2.	Natarajan K.V., "A text book of Engineering Graphics" Dhanalakshmi Publishers, Chennai, 2009
3.	Venugopal K. and Prabhu Raja V., "Engineering Drawing with AUTOCAD and building drawing" New Age International (P) Limited, 2018, 5th edition.

REFERENCE BOOKS:

1.	Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2.	Dinesh Kumar S, K. Sivakumar and R. Ramadoss, "Engineering Graphics", Maruthi Publishers, Chennai,2019.
3.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4.	Jayapoovan T, "Engineering Graphics using AUTOCAD", Vikas Publishing ,7 th Edition.
5.	Parthasarathy N S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
6.	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

WEBSITES:

1.	https://archive.nptel.ac.in/courses/112/102/112102304/
2.	https://onlinecourses.nptel.ac.in/noc23_me144/preview

JOURNALS (Publication of Bureau of Indian Standards):

1.	IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2.	IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3.	IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings
4.	IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5.	IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

COURSE DESIGNERS

1.	Dr. R. Ramadoss	Professor	Mechanical Engineering
2.	Dr. K. G. Ashok	Assistant Professor	Mechanical Engineering
3.	Mr. M. Raju	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date: 16-11-2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231GES105T	**BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING**	Periods per week				Credits
		L	T	P	R	
Regulation - R23		3	0	0	0	3

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Marks			Minimum marks for Pass	
	Continuous assessment Examination	End Semester Examination	Maximum marks	End Semester Examination	Total
3	40	60	100	45	50

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	To introduce the basics of electric circuits and analysis
2.	To impart knowledge in domestic wiring
3.	To impart knowledge in the basics of working principles and application of electricalmachines
4.	To introduce analog devices and their characteristics
5.	To introduce the functional elements and working of sensors and transducers.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	**Bloom's level**
CO1: Compute the electric circuit parameters for simple problems	K3
CO2: Map and describe the concepts of domestics wiring and protective devices	K3
CO3: Determine and explain the working principle and applications of electrical machines	K3
CO4: Analyze the characteristics of analog electronic devices	K4
CO5: Develop the types and operating principles of sensors and transducers for the instruments	K6

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 – High: 2 - Medium: 1 – Low: '-'- No correlation

UNIT	TITLE	PERIODS
I	ELECTRICAL CIRCUITS	9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor — Ohm's Law - Kirchhoff's Laws — Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor — Steady state analysis of RLC circuits (Simple problems only), Three phase supply – star and delta connection – power in three-phase systems.

UNIT	TITLE	PERIODS
II	MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS	9

Magnetic circuits-definitions-MMF, flux, reluctance, magnetic field intensity, flux density, fringing, self and mutual inductances-simple problems. Domestic wiring, types of wires and cables, earthing, protective devices-switch fuse unit- Miniature circuit breaker-moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid

UNIT	TITLE	PERIODS
III	ELECTRICAL MACHINES	9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT	TITLE	PERIODS
IV	ANALOG ELECTRONICS	9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT — Types, I-V Characteristics and Applications, Rectifier and Inverters, harmonics

UNIT	TITLE	PERIODS
V	SENSORS AND TRANSDUCERS	9

Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

TOTAL PERIODS:	45

TEXT BOOKS:

1.	D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020
2.	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015
3.	S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019
4.	James A Svoboda, Richard C. Dorf, Dorf's Introduction to Electric Circuits, Wiley,2018

REFERENCE BOOKS:

1.	John Bird, "Electrical Circuit theory and technology", Routledge; 2017.
2.	Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
3.	Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition,2017

WEBSITES:

1.	https://lit.libguides.com/c.php?g=663698&p=4693660
2.	https://libguides.wintec.ac.nz/industrial_instrumentation_and_control/websites

JOURNALS:

1.	https://www.sciencepublishinggroup.com/journal/239/home
2.	https://www.springeropen.com/p/engineering/electrical-engineering
3.	https://www.aimspress.com/journal/electreng
4.	https://lit.libguides.com/electrical-electronic-engineering/journals-databases
5.	https://www.inderscience.com/jhome.php?jcode=ijit

EXTENSIVE READER:

1.	Muhammad H. Rashid, "Spice for Circuits and electronics", 4th Edition., CengageIndia,2019.
2.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

COURSE DESIGNERS

1.	Dr. G. Babu	HOD	Department of Biotechnology
2.	Dr. Harshiny.M	Assistant Professor	Department of Biotechnology
3.	Dr. Vaidhegi K	Assistant Professor	Department of Biotechnology
5.	Mrs. B. Lakshmi Shree	Assistant Professor	Department of Biomedical Engineering

Recommended by Board of Studies	Date: 11.05.2024	Syllabus version	01
Approved by the Academic Council	Date:	Meeting No.	01

231GEH101T	HERITAGE OF TAMILS / தமிழர்மரபு	Periods per week				Credits
		L	T	P	R	
Regulation - R23		1	0	0	0	1

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	Overall
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	சங்க இலக்கியங்கள் முதல் நவீன இலக்கியங்கள் வரையிலான வளர்ச்சியை பற்றி அறிவுறுத்துதல் To know about the development from Sangam literature to modern literature
2.	பாறை ஓவியங்கள் முதல் நவீன சிற்பங்கள் வரையிலான தமிழர்கள் பற்றி அறிந்து கொள்ளுதல் Learn about Tamil art from rock paintings to modern sculptures
3.	தமிழர்கள் நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள் பற்றி அறிந்து கொள்ளுதல் To know about folk arts and heroic games of Tamils
4.	தமிழர்கள் பற்றிய அகம் மற்றும் புறம் கோட்பாடுகள் பற்றி அறிந்து கொள்ளுதல் To know about internal and external principles cherished by Tamils.
5.	இந்திய பண்பாட்டில் தமிழர்கள் பங்களிப்பு பற்றி அறிந்து கொள்ளுதல் To know about the contribution of Tamils in Indian culture

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to: இந்த பாடத்தை கற்று முடிக்கும் போது மாணவர்கள் கீழ்கண்டவற்றை பற்றி அறிந்திருப்பார்கள்:		Bloom's level
CO1:	சங்க இலக்கியங்கள் முதல் நவீன இலக்கியங்கள் வரயிலொன வளர்ச்சிரயப் பற்றி. On the Development from Sangam Literature to Modern Literature	K1, K2
CO2:	பாறை ஓவியங்கள் முதல் நவீன சிற்பங்கள் வரையிலான தமிழர்கள் பற்றி About Tamil arts from rock paintings to modern sculptures.	K1, K2
CO3:	தமிழர்கள் நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள் பற்றி. About folk arts and heroic games of Tamils	K1, K2
CO4:	தமிழர்கள் பற்றிய அகம் மற்றும் புறம் கோட்பாடுகள் About internal and external principles cherished by Tamils.	K1, K2
CO5:	இந்திய பண்பாட்டில் தமிழர்கள் பங்களிப்பு பற்றி About the contribution of Tamils in Indian culture.	K1, K2

UNIT	TITLE	PERIODS
I	**Language and literature/** **மொழி மற்றும் இலக்கியம்**	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.

இந்திய மொழிக் குடும்பங்கள்- திராவிட மொழிகள் -தமிழ் ஒரு செம்மொழி -தமிழ் செவ்விளக்கியங்கள் -சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்ந்தல் -அறம் திருக்குறளில் மேலாண்மை கருத்துக்கள் - தமிழ் காப்பியங்கள் தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம்- ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் -தமிழ் நவீன இலக்கியத்தின் வளர்ச்சி- தமிழ் இலக்கிய வளர்ச்சி- பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

UNIT	TITLE	PERIODS
II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE/** **ஒரு நிமிஷம் மரபு பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை சிற்பக்கலை**	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.

நடுக்கல் முதல் நவீன சிற்பங்கள் வரை -ஐம்புன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருள்கள்- பொம்மைகள் -தேர் செய்யும் கலை- சுடுமண் சிற்பங்கள் -நாட்டுப்புற தெய்வங்கள்- குமரி முனையில் திருவள்ளுவர் சிலை- இசைக்கருவிகள் -மிருதங்கம் -பறை -வீணை- யாழ் -நாதஸ்வரம்- தமிழர்களின்- சமூக வாழ்வில் கோவில்களின் பங்கு.

UNIT	TITLE	PERIOD S
III	**FOLK AND MARTIAL/** **நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுக்கள்**	3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

தெருக்கூத்து -கரகாட்டம் -வில் பாட்டு -கனியான் கூத்து -ஒயிலாட்டம்-தோல் பாவை -சிலம்பாட்டம் -வளரி புலியாட்டம் -தமிழர்களின் விளையாட்டுகள்

UNIT	TITLE	PERIOD S
IV	**THINAI CONCEPT OR TAMILS/** **தமிழர்களின் திணை கோட்பாடுகள்**	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.

தமிழகத்தில் தாவரங்களும் விலங்குகளும் -தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறம் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு- சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவு கல்வியும் - சங்க கால நகரங்களும் துறைமுகங்களும்- சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி- கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

UNIT	TITLE	PERIOD S
V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE /** **தமிழ் தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு**	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.

இந்திய விடுதலை போரில் தமிழர்களின் பங்கு- இந்தியாவின் பிற்பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் -சுயமரியாதை இயக்கம்- இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு- கல்வெட்டுக்கள்- கையெழுத்து படிகள்- தமிழ் புத்தகங்களின் -அச்சு வரலாறு

TOTAL PERIODS:	15

TEXT BOOKS CUM REFERENCE BOKS:

1.	தமிழக வரலாறு மக்களும் பண்பாடும் கே. கே. பிள்ளை, வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்
2.	கணினி தமிழ் முனைவர் இல. சுந்தரம் (விகடன் பிறசுரம்)
3.	வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் தொழில்துறை வெளியீடு
4.	பொருறை ஆற்றங்கரை நாகரிகம் தொழில்துறை 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) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE DESIGNERS

1.	Anna University, Chennai

Recommended by Board of Studies	Date:	Syllabus version	-
Approved by the Academic Council	Date:	Meeting No.	6

231PYB111L	PHYSICS LABORATORY (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	2	0	1

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	
3	60 %	40 %	-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To impart knowledge on experimental skills to determine elastic, optical and thermal properties of materials.
2.	To demonstrate the experimental determination of compressibility of liquid and band gap of a semiconductor.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		Bloom's level
CO1:	determine the elastic properties of materials using torsional pendulum and non-uniform bending.	K3
CO2:	determine the optical properties of light waves using optical fibre, laser, and spectrometer.	K3
CO3:	determine the physical properties of materials using Lee's disc apparatus and air wedge.	K3
CO4:	calculate the compressibility of liquid using ultrasonic interferometer.	K3
CO5:	calculate the band gap of a semiconductor using band gap apparatus.	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	1
3 — High : 2 - Medium : 1 — Low : '-' - No correlation												

ANY FIVE EXPERIMENTS	
S. No	**NAME OF THE EXPERIMENT**
1	Torsion Pendulum – Rigidity modulus of wire and moment of inertia of disc
2	Non-Uniform Bending – Determination of Young's modulus
3	Semiconductor Laser –Wavelength of laser light and Size of particle
4	Optical Fiber – Numerical Aperture and Acceptance Angle
5	Lee's Disc method - Determination of thermal conductivity of a bad conductor
6	Spectrometer – Dispersive power of the prism
7	Air Wedge – Measurement of thickness of thin wire
EXPERIMENTS BEYOND THE SYLLABUS	
ANY ONE EXPERIMENT	
1	Ultrasonic Interferometer - Velocity of sound and Compressibility of liquid
2	Determination of the Band gap of a semiconductor

TOTAL PERIODS:	15

REFERENCE BOOKS:	
1	Physics Laboratory Manual, Department of Physics, Easwari Engineering College.
2	R.K. Shukla and Anchal Srivastava, Practical Physics, 1st Edition, New Age International (P) Ltd, New Delhi, 2006.
3	G.L. Souires, Practical Physics, 4th Edition, Cambridge University, UK, 2001.
4	D. Chattopadhyay, P.C. Rakshit and B. Saha, An Advanced Course in Practical Physics, 2nd ed., Books & Allied Ltd., Calcutta, 1990.

COURSE DESIGNERS

1.	Dr. S. Nirmala	Assoc Professor & Head	Department of Physics
2.	Dr. G. Rajkumar	Professor	Department of Physics
3.	Dr. R. Sivakumar	Asst Professor	Department of Physics
4.	Dr. K. Raju	Asst Professor	Department of Physics

Recommended by Board of Studies	Date: 12-10-2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231GES112L	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY** (Common to Automobile, Mechanical and Civil)	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	4	0	2

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	Overall
3	60 %	40 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:

1.	To train the students in residential wiring.
2.	To gain practical knowledge in performance characteristics of analog devices
3.	To acquire exposure in combinational circuits

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		**Bloom's level**
CO1:	Carry out the simple electrical wiring of a residential building.	K3
CO2:	Measure the electrical quantities using Energy meter and Megger	K3
CO3:	Calculate the voltage and current parameters of given circuits using Kirchhoff's Laws.	K3
CO4:	Analyze the characteristics of analog devices.	K4
CO5:	Construct combinational circuits with logic gates.	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 — High : 2 - Medium : 1 — Low   : '-' - No correlation

LIST OF EXPERIMENTS	
1.	Fluorescent Lamp wiring.
2.	Staircase wiring.
3.	Fabricate and test a PCB layout for a given circuit.
4.	Study of Single-Phase Energy meter.
5.	Study of earth resistance measurement using Megger.
6.	Verification of Kirchhoff's Laws.
7.	Characteristics of PN and Zener Diodes.
8.	Characteristics of BJT.
9.	Half wave and Full Wave rectifiers.
10.	Study of Logic Gates.
11.	Implementation of Binary Adder and Subtractor.
12.	Characteristics of the LVDT.

TOTAL PERIODS:	45

REFERENCE BOOKS:

1.	Mittle V.N, Arvind Mittal, "Basic Electrical Engineering", Tata Mc Graw Hill (India), Second Edition, 2013.
2.	Sedha R.S., "A Text Book of Applied Electronics", S. Chand & Co., 2014

COURSE DESIGNERS

1.	Dr. M. Sujatha	Assistant Professor	EEE
2.	Mrs. D. Chandrakala	Assistant Professor	EEE
3.	Mrs. K. A. Indu Sailaja	Assistant Professor	EEE

Recommended by Board of Studies	Date: 30.10.2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

SYLLABUS OF
SEMESTER – II
COURSES

231LEH201T	PROFESSIONAL COMMUNICATION (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
Regulation - R23		3	0	0	0	3

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		
	Continuous Assessment Examination	End Semester Examination		Continuous Assessment Examination	End Semester Examination	Overall
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:

1.	To develop the basic writing skills of the First year Engineering students.
2.	To help learners develop their listening skills, which will, enable them to listen to lectures and enhance their ability to comprehend by asking questions and seeking clarification.
3.	To help learners develop their speaking skills and help them to speak fluently.
4.	To inculcate reading habit and to develop effective reading skills.
5.	To help students improve their active and passive vocabulary.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		Bloom's level
CO1:	Listen, Understand and Respond to others in different situations	
CO2:	Speak correctly and fluently in different situations using appropriate communication strategies.	
CO3:	Read and comprehend a range of texts adopting different reading skills.	
CO4:	Write with clarity in simple, apt and flawless language with coherence and cohesion.	
CO5:	Use their communicative competency with purpose and clarity in the context of Science and Technology	

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	1	-	-
CO2	-	-	-	-	-	-	-	-	1	2	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	1	-	1
CO6	-	-	-	-	-	-	-	-	1	-	-	-

3 — High: 2 - Medium: 1 — Low ： '-'– No correlation

UNIT	TITLE	PERIODS
I	**Listening:** Listening to talks and complete information gap exercises. (Comprehension). **Speaking:** Introduction to speaking mechanics. **Reading:** Prescribed non-detail text. **Writing:** Communication-Process/ forms /barriers. Vocabulary and Grammar: Purpose and function- Active/Passive voice/Impersonal passive voice - Numerical adjectives - Words used as different parts of speech – Contextual meaning of words	9

UNIT	TITLE	PERIODS
II	**Listening:** Listening to documentaries and interpret **Speaking:** Speaking an advertisements/ gadget reviews user manuals **Reading:** Prescribed non-detail text - Reading longer technical texts **Writing:** Interpreting Chart/ graphs — letter writing (placing order/ escalation/ complaint) Vocabulary and Grammar: Transformation of sentences –Simple, Complex, and Compound sentences- Modal verb –Infinity and Gerund — Error correction.	9

UNIT	TITLE	PERIODS
III	**Listening:** Listening to technical talk and making notes. **Speaking:** Describing a process. **Reading:** Prescribed non-detail text- reading editorials and opinion blogs. **Writing:** Essay writing (descriptive/ argumentative/ analytical/ narrative). Vocabulary and Grammar: Words often misspelt –Synonyms and antonyms — Modifiers — Direct / Indirect.	9

UNIT	TITLE	PERIODS
IV	**Listening:** Listening to Online interviews and discussion. **Speaking:** Small Talk (any random topics **Reading:** Prescribed non-detail text. **Writing:** Report Writing (accident/ industrial / Feasibility/ project) Vocabulary and Grammar: Extended definition — cause and effect expressions –Verbal analogies- Compound nouns.	9

UNIT	TITLE	PERIODS
V	**Listening:** Listening for taking notes and seeking clarifications. **Speaking:** Group Discussion- Etiquette/ Do's and Dont's. **Reading:** Prescribed non-detail text, **Writing:** Cover letter and Resume writing – Minutes of Meeting Vocabulary and Grammar: Collective noun - Relative clause – Redundancies.	9

| **TOTAL PERIODS:** | | **45** |

TEXT BOOKS:

1.	V. Chellamal, Deepa Mary Francis, K.N Shoba, P.R Sujatha Priyadharsini, Veena Selvam English for science and Technology, Cambridge University Press and Assessment 2023

REFERENCE BOOKS:

1.	Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
2.	Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge,2011.
3.	Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning, USA: 2007.

WEBSITES:

1.	https://www.usingenglish.com
2.	http://grammarbook.com

JOURNALS:

1.	National Council for Teachers of English
2.	https://www2.ncte.org/resources/journals/college-english/

EXTENSIVE READER:

1.	Spencer Johnson, Who Moved My Cheese, Putnam Adult, 1998

COURSE DESIGNERS

1.	Dr Usha Menon	Professor	Department of English
2.	Dr Sam Dawson	Professor and Head	Department of English
3.	Ms Jean Ida	Assistant Professor	Department of English
4.	Ms Moby	Assistant Professor	Department of English
5	Ms Surya S	Assistant Professor	Department of English
6	Dr Rudhra T S	Assistant Professor	Department of English

Recommended by Board of Studies	Date: 12-10-2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231MAB201T	ADVANCED CALCULUS AND COMPLEX ANALYSIS	Periods per week				Credits
		L	T	P	R	
Regulation - R23	(Common to all branches of Engineering and Technology)	3	2	0	0	4

SCHEME OF EXAMINATION					
Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous Assessment Examination	End Semester Examination	Continuous Assessment Examination	End Semester Examination	
3	40 %	60 %	-	45%	50%

PREREQUISITES:
Basic Knowledge of Complex Variables, Vector Algebra and Integration

COURSE OBJECTIVES:	
1.	To compute area of closed surface and volume of solids using multiple integrals
2.	To evaluate Line, Surface and Volume integrals
3.	To find the Laplace Transforms and inverse transforms for standard functions
4.	To apply C-R equations in the construction of Analytic Functions
5.	To study the methods of Complex Integration, finding Taylor's and Laurent's Series expansions

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Evaluate the double and triple integrals	K6
CO2:	Evaluate Line, Surface, and Volume integrals.	K6
CO3:	Obtain the Laplace Transforms and inverse transforms of standard functions.	K5
CO4:	Solve problems in Analytic functions and construction of analytic functions using C-R equations	K5
CO5:	Solve problems using integration techniques, find Taylor's and Laurent's Series expansions	K4

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 – High: 2 - Medium: 1 – Low: '-'- No correlation

UNIT	TITLE	PERIODS
I	**MULTIPLE INTEGRALS**	9+3

Double integrals in Cartesian and polar coordinates – Change of order of integration, Area enclosed by plane curves – Change of variables in double integrals, Triple integrals

UNIT	TITLE	PERIODS
II	**VECTOR CALCULUS**	9+3

Gradient and directional derivative – Divergence and curl – Irrotational and Solenoidal vector fields, Line integral over a plane curve, Surface integral – Area of a curved surface, Volume integral, Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals (Cubes and Cuboids only)

UNIT	TITLE	PERIODS
III	**LAPLACE TRANSFORM**	9+3

Definition, properties, existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function, shifting theorems, transforms of derivatives and integrals, Initial and final value theorems, Periodic functions, Inverse transforms – Convolution theorem-, Solving linear second order ordinary differential equations with constant coefficients using Laplace transforms

UNIT	TITLE	PERIODS
IV	**ANALYTIC FUNCTIONS**	9+3

Analytic functions – necessary and sufficient conditions, Cauchy-Riemann equations in Cartesian and polar form – Properties – harmonic functions, Construction of analytic function by Milne Thomson method, conformal mapping – some standard transformations $w = z + c$, cz, $1/z$, bilinear transformation.

UNIT	TITLE	PERIODS
V	**COMPLEX INTEGRATION**	9+3

Line integral – Cauchy's integral theorem – Cauchy's integral formula, Taylor's and Laurent's series, Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour (except the poles on the real axis). line, surface and volume integrals.

TOTAL PERIODS:		**60**

TEXT BOOKS:

1.	Joel Hass, Christopher Heil and Maurice D. Weir "Thomas' Calculus", 14th Edition, Pearson.
2.	Grewal. B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018
3.	Workbook on" Advanced calculus and Complex Analysis", Chess Publications, Prepared by Department of Mathematics

REFERENCE BOOKS:

1.	Bali N P, Manish Goyal, "A Textbook of Engineering Mathematics", Ninth Edition, Laxmi Publications Pvt Ltd, 2016.
2.	James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015
3.	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
4.	T Veerarajan," Engineering Mathematics II", McGraw Hill (India) Private Limited, Chennai

WEBSITES:

1.	www.pearsoned.co.in/georgebthomasjr
2.	www.webassign.net
3.	https://onlinecourses.nptel.ac.in/noc22_ma08/course

COURSE DESIGNERS

1.	Dr. S. Muthukumar	Professor	Department of Mathematics
2.	Dr. S. R. Ananthalakshmi	HOD / Associate Professor	Department of Mathematics
3.	Dr. K. S.Vidhyaa	Assistant Professor (Sr.G)	Department of Mathematics

Recommended by Board of Studies	Date:12.10.2023	Syllabus version	V.1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231BTC201T	**MATERIALS SCIENCE FOR BIOTECHNOLOGISTS**	Periods per week				Credits
		L	T	P	R	
Regulation - R23		3	0	0	0	3

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Marks			Minimum marks for Pass	
	Continuous assessment Examination	End Semester Examination	Maximum marks	End Semester Examination	Total
3	40	60	100	45	50

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	To make the students effectively to understand the basics of crystallography and crystalimperfections.
2.	To enable the students to get knowledge on various strengthening methods of materials, and various mechanical properties and their measurement.
3.	To impart knowledge on the basics of phase diagrams and their applications.
4.	To learn about iron-carbon system, and about various ferrous and non-ferrous alloys.
5.	To introduce different types of bio materials and their applications.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	Bloom's level
CO1: Understand and analyze the basics of crystallography and its importance in materials properties	K2
CO2: understand and use the significance of dislocations, strengthening mechanisms, and tensile, creep,hardness, and fracture behavior of materials	K2
CO3: gain knowledge on binary phase diagrams, and will be able to determine the phasecomposition and phase amount.	K3
CO4: Enumerate the Fe-C system and various micro structures in it, and about various ferrous and non-ferrous alloys.	K5
CO5: Design and develop on metallic, ceramic, and polymeric bio materials and their applications.	K6

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 – High: 2 - Medium: 1 – Low: '-'   - No correlation

UNIT	TITLE	PERIODS
I	**CRYSTALLOGRAPHY**	9

Crystallographic directions and planes – metallic crystal structures: BCC, FCC and HCP – linear and planar densities – crystal imperfections- edge and screw dislocations, Burger's vector and elastic strain energy- surface imperfections – grain and twin boundaries – Polymorphism – phase changes – nucleation and growth – homogeneous and heterogeneous nucleation

UNIT	TITLE	PERIODS
II	**MECHANICAL PROPERTIES**	9

Tensile test - plastic deformation by slip – slip systems – mechanisms of strengthening in metals: strain hardening, grain size reduction, solid solution strengthening, precipitation hardening — Creep: creep curves, stress and temperature effects, mechanisms of creep, creep-resistant materials — Fracture: ductile and brittle fractures - the Griffith criterion – fracture toughness - Fatigue failure: the S-N curve — factors that affect fatigue life — Hardness: Rockwell and Brinell hardness tests, Knoop and Vickers microhardness tests

UNIT	TITLE	PERIODS
III	**PHASE DIAGRAMS**	9

Basic concepts - Gibbs phase rule –Unary phase diagram (iron) - Binary phase diagrams: isomorphous systems (Cu-Ni) –determination of phase composition and phase amounts — tie line and lever rule - binary eutectic diagram with no solid solution and limited solid solution (Pb-Sn) — eutectoid and peritectic reactions - other invariant reactions – microstructural development during the slow cooling: eutectic, hypereutectic and hypoeutectic compositions.

UNIT	TITLE	PERIODS
IV	**FERROUS AND NONFERROUS ALLOYS**	9

The Fe-Fe$_3$C phase diagram: phases, invariant reactions, development of microstructure in eutectoid, hypoeutectoid and hypereutectoid alloys–influence of other alloying elements in the Fe- C system - phase transformations –isothermal transformation diagram for eutectoid iron-carbon alloy — microstructures: pearlite, bainite, spheroidite and martensite — steels, stainless steels and cast irons — copper alloys — aluminum alloys — titanium alloys.

UNIT	TITLE	PERIODS
V	**MATERIALS FOR BIOLOGICAL APPLICATIONS**	9

Biocompatibility – host response – materials response – Metallic implants: Titanium and its alloys, stainless steel – Cobalt-Chromium alloys – Tantalum – Nitinol – magnesium based biodegradable alloys. Bioceramics: Alumina, Zirconia, hydroxyapatite, tricalcium phosphate, bioactive glasses, pyrolytic carbon, graphite, graphene. Polymeric implant materials: Polyethylene, polypropylene, polyacrylates – soft and hard tissue replacement materials.

TOTAL PERIODS:	45

TEXT BOOKS:	
1.	R.Balasubramaniam, Callister's Materials Science and Engineering.Wiley (Indian Edition),2014.
2.	V.Raghavan. Materials Science and Engineering: A First Course, Prentice Hall India Learning Private Limited, 2015.
3.	Joon Park and R.S.Lakes, Biomaterials: An Introduction, Springer, 2007.

REFERENCE BOOKS:	
1.	J.F.Shackelford. Introduction to Materials Science for Engineers. Pearson,2015

2.	Wendelin Wright and Donald Askeland , Essentials of Materials Science and Engineering,CL Engineering, 2013.
3.	J.C. Anderson, K.D. Leaver, P. Leevers and R.D. Rawlings, Materials Science for Engineers, CRC Press, 2003.

WEBSITES:

1.	https://www.sciencelearn.org.nz/topics/biotechnology
2.	https://www.btci.org/k-12-programs/resources-for-biotechnology-education/

JOURNALS:

1.	https://biotechsustainablematerials.biomedcentral.com/
2.	https://www.worldscientific.com/worldscinet/ijcmse
3.	https://www.mdpi.com/journal/ijms/sections/material_sciences
4.	https://crimsonpublishers.com/rdms/
5.	https://www.asjp.cerist.dz/en/PresentationRevue/660

EXTENSIVE READER:

1.	Jean P.Mercier, G.Zambelli and W.Kurz, Introduction to Materials Science,Elsevier, 2002.
2.	Sujata V.Bhat , Biomaterials, Narosa Publishers, 2002.

COURSE DESIGNERS

1.	Dr. G. Babu	HOD	Department of Biotechnology
2.	Dr. Harshiny. M	Assistant Professor	Department of Biotechnology
3.	Dr. Vaidhegi K	Assistant Professor	Department of Biotechnology
4.	Mrs. B. Lakshmi Shree	Assistant Professor	Department of Biomedical Engineering

Recommended by Board of Studies	Date: 11.05.2024	Syllabus version	01
Approved by the Academic Council	Date:	Meeting No.	01

231BTC202T	**BIOORGANIC CHEMISTRY**	Periods per week				Credits
		L	T	P	R	
Regulation - R23		3	0	0	0	3

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Marks			Minimum marks for Pass	
	Continuous assessment Examination	End Semester Examination	Maximum marks	End Semester Examination	Total
3	40	60	100	45	50

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	To enable the students to understand the basics concepts of chemical reactions
2.	To make students understand the kinetics and its reaction mechanism
3.	To understand about the modern techniques of kinetic and thermodynamic methods
4.	To study of Enzyme selectivity and its catalytic property in various organic synthetic reactions.
5.	To apply modern organic techniques of bioorganic reactions and various biosynthesis methods.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	**Bloom's level**
CO1: Describe the basic elements of protein structure, the DNA double helix, and RNA structures.	K3
CO2: Describe the basic chemical and structural elements of replication, transcription, and translation.	K3
CO3: Outline the basic metabolic pathways for glucose metabolism, amino acid biosynthesis and breakdown, fatty acid production and breakdown.	K3
CO4: Describe fundamental chemical mechanisms for each of the major types of chemical reactions observed in biochemistry,	K4
CO5: Develop various biochemical reactions and biosynthesis techniques	K6

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 – High: 2 - Medium: 1 – Low: '- '- No correlation

UNIT	TITLE	PERIODS
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 – Conformation analysis ethane, butane and cyclohexane - Cis- trans isomerism. Stereochemical activity around the tetrahedral carbon — optical activity - Conformation of the peptide bond.

UNIT	TITLE	PERIODS
II	**MECHANISMS OF SUBSTITUTION AND ADDITION REACTIONS**	9

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	TITLE	PERIODS
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	TITLE	PERIODS
IV	**CATALYSIS**	9

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

UNIT	TITLE	PERIODS
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 PERIODS:	45

TEXT BOOKS:	
1.	Carey, Francis A." Organic Chemistry". VIIth Edition, Tata McGraw Hill, 2009.
2.	Page, M.I. and Andrew Williams "Organic and Bio-organic Mechanisms". Pearson, 2010
3.	The Organic Chemistry of Biological Pathways, Authors: John E. McMurry and Tadhg P. Begley Publisher: Roberts and Company Publishers, Englewood, CO

REFERENCE BOOKS:	
1.	Dugas, Hermann "Bioorganic Chemistry: A Chemical Approach to Enzyme Action" 3rdEdition, Springer, 2003

WEBSITES:

1.	https://www.khanacademy.org/science/organic-chemistry
2.	https://www.organic-chemistry.org/

JOURNALS:	
1.	https://www.sciencedirect.com/journal/bioorganic-chemistry
2.	https://pubs.acs.org/doi/abs/10.1021/jo900183c
3.	https://www.taylorfrancis.com/books/mono/10.1201/9780203381090/introduction-bioorganic-chemistry-chemical-biology-gregory-weiss-david-van-vranken
4.	https://www.tandfonline.com/doi/full/10.1080/13102818.2020.1731333
5.	https://chemistry-europe.onlinelibrary.wiley.com/doi/abs/10.1002/cmdc.201700157

EXTENSIVE READER:	
1.	Highlights in Bioorganic Chemistry, Carsten Schmuck, Helma Wennemers , Hardcover, 600 Pages, First Edition, March 2004
2.	Advanced Organic Chemistry, Francis A. Carey, Richard A. Sundberg, Paperback, 1199 Pages 5th Edition, 2007, ISBN-13: 978-0-387-44897-8

COURSE DESIGNERS			
1.	Dr. G. Babu	HOD	Department of Biotechnology
2.	Dr. Harshiny. M	Assistant Professor	Department of Biotechnology
3.	Dr. Vaidhegi. K	Assistant Professor	Department of Biotechnology
5.	Mrs. B. Lakshmi Shree	Assistant Professor	Department of Biomedical Engineering

Recommended by Board of Studies	Date: 11.05.2024	Syllabus version	01
Approved by the Academic Council	Date:	Meeting No.	01

231GES201T	PYTHON PROGRAMMING	Periods per week				Credits
		L	T	P	R	
Regulation - R23		2	0	0	0	2

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		
	Continuous Assessment Examination	End Semester Examination		Continuous Assessment Examination	End Semester Examination	Overall
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:

1.	To introduce the basics of algorithmic problem solving
2.	To solve problems using Python conditionals and loops.
3.	To use Python function calls to solve problems.
4.	To impart Python data structures - lists, tuples, dictionaries to represent complex data
5.	To implement file operations using Python.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	Bloom's level
CO1: Solve problems using algorithms, flowchart, and pseudocode.	K4
CO2: Use python conditional and iteration statements for problem solving.	K3
CO3: Apply strings and user defined functions in python programming.	K3
CO4: Choose appropriate python data structures for real time applications.	K4
CO5: Develop Python code to manipulate data using file and exception-handling.	K6

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	0	0	0	0	0	2	1	1
CO2	1	2	1	1	0	0	0	0	0	1	0	1
CO3	2	2	1	1	0	0	0	0	0	1	0	1
CO4	2	2	1	1	0	0	0	0	0	1	0	1
CO5	1	3	2	2	0	2	1	0	0	1	1	1
3 —— High : 2 - Medium : 1 —— Low : „-„ - No correlation												

UNIT	TITLE	PERIODS
I	**ALGORITHMIC PROBLEM SOLVING**	5

Fundamentals of Computing -Algorithms, building blocks of algorithms (statements, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT	TITLE	PERIODS
II	**CONTROL FLOW STATEMENTS**	7

Python interpreter, interactive mode and script mode; variables, expressions, statements; values and data types; Operators and Precedence of operators; Conditionals: conditional, alternative, chained conditional, nested conditional; Iterations: while, for, break, continue.

UNIT	TITLE	PERIODS
III	**FUNCTIONS AND STRINGS**	6

Function definition and flow of execution, parameters and arguments; Fruitful functions, composition, recursion; Strings: string slices, immutability, Looping and counting, String methods.

UNIT	TITLE	PERIODS
IV	**LIST, TUPLE AND DICTIONARIES**	8

Lists: list operations: list slices, , traversing, mutability, aliasing, list methods, list arguments, list comprehension; Tuples: Operations, tuple assignment; Dictionaries: Operations, functions and Looping.

UNIT	TITLE	PERIODS
	FILES, EXCEPTIONS	4

Files: Text files, reading and writing files, Exceptions: handling exceptions, multiple exception blocks, finally block.

TOTAL PERIODS:	30

TEXT BOOKS:	
1.	Reema Thareja ―Python Programming using Problem solving Approach‖, Oxford University Press.

REFERENCE BOOKS:	
1.	Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
2.	Paul Gries, Jennifer Campbell and Jason Montojo, Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.
3.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist, Version 2.0.17 edition, Updated for Python 3, Shroff /O'Reilly Publishers, (http://greenteapress.com/wp/thinkpython/)

WEBSITES:	
1.	https://www.python.org
2.	https://www.learnpython.org
3.	https://www.w3schools.com/python/

JOURNALS:	
1.	Nil

EXTENSIVE READER:	
1.	Nil

COURSE DESIGNERS			
1.	Dr.N.Ananthi	Professor & Head	Information Technology
2.	Dr.G.S.Anandha Mala	Professor & Head	Computer Science and Engineering
3.	Mrs.B.Chandra	Assistant Professor	Information Technology
4.	Dr.J.Deepa	Associate professor	Computer Science and Engineering
5	A.Jeba Sheela	Assistant Professor	Computer Science and Engineering

Recommended by Board of Studies	Date: 20-10-2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231GEH201T	Tamils and Technology /தமிழரும் தொழில் நுட்பமும்	Periods per week				Credits
		L	T	P	R	
Regulation - R23		1	0	0	0	1

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		
	Continuous Assessment Examination	End Semester Examination		Continuous Assessment Examination	End Semester Examination	Overall
3	40 %	60 %		-	45%	50%

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	தமிழர்களின் நெசவு மற்றும் மண் பாண்டங்கள் தொழில் நுட்பங்களில் சிறந்து விளங்கியவர்களை பற்றி அறிவுறுத்துதல் / To know that Tamils have excelled in weaving and pottery techniques.
2.	கட்டிட வடிவமைப்பு மற்றும் கட்டிட தொழில்நுட்பங்களில் தமிழர்கள் சிறந்து விளங்கியதை எடுத்துக்காட்டுகளுடன் அறிவுறுத்துதல் / To Exemplify Tamil excellence in architectural design and construction techniques.
3.	கப்பல் கட்டுதல், இரும்புத்தொழில், நாணயம் அச்சிடுதல், மணி தயாரித்தல் பற்றிய உற்பத்தி தொழில்நுட்பங்களில் தமிழர்கள் திறனுடன் விளங்கியதை பற்றி அறிவுறுத்துதல் / To show that Tamils were skilled in manufacturing techniques such as ship building, iron industry, coin minting, bell making etc.
4.	ஏரி, குளம், கிணறு, போன்றவற்றை வடி அமைத்தல் மூலமாகவும் பராமரித்தல் மூலமாகவும் தமிழர்கள் விவசாயம் மற்றும் நீர் பாசன தொழில்நுட்பத்தில் சிறந்து விளங்கியதை பற்றி அறிவுறுத்துதல் / To promote Tamil excellence in agriculture and irrigation technology through design and maintenance of dams, streams, ponds, wells etc.
5.	அறிவியல் தமிழ் மற்றும் கணித தமிழ் வளர்ச்சியும் தமிழ் மென்பொருள் உருவாக்கம் பற்றி அறிவுறுத்துதல் / To know about Scientific Tamil and Digital Tamil development and Tamil software development.

COURSE OUTCOMES (COs):

இந்த பாடத்தினை கற்று முடிக்கும் பொழுது மாணவர்கள் கீழ்கண்டவற்றை பற்றி அறிந்திருப்பார்கள். Upon completion of this course, students will be aware of the following:	Bloom's level
CO1: தமிழர்களின் நெசவு மற்றும் மண் பாண்டங்கள் தொழில் நுட்பங்களில் சிறந்து விளங்கியவர்களை பற்றி. / About Tamils excelling in weaving and pottery techniques.	K1, K2

CO2:	கட்டிட வடிவமைப்பு மற்றும் கட்டிட தொழில்நுட்பங்களில் தமிழர்கள் சிறந்து விளங்கியதை எடுத்துக்காட்டுகளுடன் பற்றி. / About the excellence of Tamils in architectural design and construction techniques.	K1, K2
CO3:	கப்பல் கட்டுதல் இரும்புத்தொழில் நாணயம் அச்சிடுதல் மணி தயாரித்தல் பற்றிய உற்பத்தி தொழில்நுட்பங்களில் தமிழர்கள் திறனுடன் விளங்கியதை பற்றி/ About Tamils becoming proficient in manufacturing techniques like ship building, iron industry, coinage, bell making etc.	K1, K2
CO4:	ஏரி குளம் கிணறு போன்றவற்றை வடி அமைத்தல் மூலமாகவும் பராமரித்தல் மூலமாகவும் தமிழர்கள் விவசாயம் மற்றும் நீர் பாசன தொழில்நுட்பத்தில் சிறந்து விளங்கியதை பற்றி. / About how Tamils excelled in agriculture and irrigation technology by designing and maintaining dams, streams, ponds, wells etc.	K1, K2
CO5:	அறிவியல் தமிழ் மற்றும் கணித தமிழ் வளர்ச்சியும் தமிழ் மென்பொருள் உருவாக்கம் பற்றியும் / About Development of Scientific Tamil and Digital Tamil and Tamil Software Development	K1, K2

UNIT	TITLE	PERIODS
I	**WEAVING AND CERAMIC TECHNOLOGY /** **நெசவு மற்றும் பானைத் நதாழில் நுட்பம்**	3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

சங்க காலத்தில் தெசவுத் தொழில் - பொனைத் தொழில் நுட்பம்- கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

UNIT	TITLE	PERIODS
II	**DESIGN AND CONSTRUCTION TECHNOLOGY /** **வடிவனமப்பு மற்றும் கட்டிடத் நதாழில் நுட்பம்**	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.

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அனமப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - சோழர் காலத்து பெருங் கோயில்கள் மற்றும் பிற வழிபொட்டுத் தலங்கள் - நாயக்கர் காலக்கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுனர மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை

UNIT	TITLE	PERIODS
III	**MANUFACTURING TECHNOLOGY / உற்பத்தித் நதாழில் நுட்பம்**	3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and goldCoins 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.

கப்பல் கட்டும் கலை -உலோகவியல் இரும்பு தொழிற்சாலை- இரும்பை உருக்குதல்- எஃகு வரலாற்று சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள்- நாணயங்கள் அச்சடித்தல் -மணி உருவாக்கம் தொழிற்சாலைகள்கல், மணிகள் -கண்ணாடிமணிகள், சுடுமண் மணிகள்- சங்கு மணிகள்- எலும்புதுண்டுகள்- தொல்லியல் சான்றுகள்- சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

UNIT	TITLE	PERIODS
IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY / வவளாண்னம மற்றும் தீர்ப்பாசைத் நதாழில் நுட்பம்**	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.

அணை, ஏரி -குளங்கள் – மதகு- சோழர் கால குமும்பின் முக்கியத்துவம்-கால்நடை பராமரிப்பு கால்நடைகளுக்கான வடிவமைக்கப்பட்ட கிணறுகள்- வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள்- கடல் சார்ந்த அறிவு- மீன் வளம்- முத்து மற்றும் முத்து குளித்தல்- பெருங்கடல் குறித்த பண்டைய அறிவு சார்ந்த சமூகம்.

UNIT	TITLE	PERIODS
V	**SCIENTIFIC TAMIL & TAMIL COMPUTING / அறிவியல் தமிழ் மற்றும் கணித்தமிழ்**	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.

அறிவியல் தமிழின் வளர்ச்சி -கணித தமிழ் வளர்ச்சி- தமிழ் நூல்களை மின் பதிப்பு செய்தல்- தமிழ் மென்பொருள்- உருவாக்கம் தமிழ்- இணைய கல்வி கழகம்- தமிழ் மின் நூலகம்- இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்

TOTAL PERIODS:	15

TEXT BOOKS CUM REFERENCE BOOKS:

1.	தமிழக வரலாறு மக்களும் பண்பாடும் கே. கே பிள்ளை, வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்
2.	கணினி தமிழ் முனைவர் இல. சுந்தரம் (விகடன் பிறசுரம்)
3.	வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் தொழிலில் துறை வெளியீடு
4.	பொருநை ஆற்றங்கரை நகரில் தொழிலில் 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) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE DESIGNERS

1.	Anna University, Chennai

Recommended by Board of Studies	Date:	Syllabus version	-
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231CYB111L	CHEMISTRY LABORATORY (Common to all branches of Engineering and Technology)	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	2	0	1

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	
3	60 %	40 %	-	45%	50%

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	To acquire practical skills in the determination of water quality parameters.
2.	To impart the students with the determination of the molecular weight of the polymer by using a viscometer.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	Bloom's level
CO1: Determine the water quality parameters like hardness and DO content.	K3
CO2: Calculate the molecular weight and classify the polymers.	K3
CO3: Estimate the strength of acids using instrumental techniques.	K3
CO4: Analyze the alkalinity parameters of water.	K4

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 — High: 2 - Medium: 1 — Low   : '-'- No correlation

List of experiments: (Any Five Experiments)

1. Determination of alkalinity in the given water sample
2. Estimation of total, temporary & permanent hardness of water by EDTA method
3. Determination of chloride content of water sample by Argentometric method
4. Find the molecular weight of PVA using Ostwald viscometer
5. Determine the strength of given strong acid using pH meter
6. Evaluate the strength of acids in a mixture by conductometric titration
7. Estimation of Fe^{2+} by Potentiometric titration
8. Determination of BOD and COD in water sample

Content beyond the syllabus: (Any one)

9. Demonstrate the of DO Content of water sample by Wrinkler method
10. Estimation of Iron content of water sample using spectrophotometer (1,10 – Phenanthroline/ thiocyanate method)

TOTAL PERIODS:	**30**

TEXT BOOKS:

1.	Dr. C. Ravichandran, "Engineering Chemistry Laboratory" Global publications, India, (2020)
2.	Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of practical organic chemistry, LBS Singapore (1994)

COURSE DESIGNERS

1.	Dr. C. Ravichandran	Professor	Chemistry
2.	Dr. R. Anithadevi	Assistant Professor	Chemistry
3.	Dr. V.Vanitha	Assistant Professor	Chemistry

Recommended by Board of Studies	Date: 12.10.2023	Syllabus version	1.0
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231GES113L	BASIC ELECTRICAL WORKSHOP	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	2	0	1

SCHEME OF EXAMINATION					
Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	
3	60 %	40 %	-	45%	50%

COURSE OBJECTIVES:

1.	To provide practical knowledge to the students on basic electric circuits.
2.	To provide knowledge on the working of electrical measuring instruments.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	Bloom's level
CO1: Carry out connections for simple house hold wiring	K3
CO2: Measure basic electrical parameters for a given circuit using measuring instruments	K3
CO3: Apply the electrical theorems for a given circuit and find its electrical parameters.	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 — High: 2 - Medium: 1 — Low   : '- '– No correlation

S. No	LIST OF EXPERIMENTS (Any eight)
1.	Verification of Ohm's law
2.	Verification of Kirchoff's laws
3.	Verification of Superposition theorem
4.	Verification of Thevenin's theorem
5.	Verification of Norton's theorem
6.	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
7.	Fluorescent lamp wiring.

8.	Stair case wiring
9.	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
10.	Measurement of energy using single phase energy meter.

S. No	EXPERIMENTS BEYOND THE SYLLABUS (Any one)
1.	Measurement of resistance to earth of electrical equipment.
2.	Load test on separately excited DC generator.
3.	Measure the unknown Resistance by Wheatstone's bridge.

	TOTAL PERIOD:	30

REFERENCE BOOKS:

1.	V. N. Mittal and Arvind Mittal; "Basic Electrical Engineering" McGraw Hill
2.	Vincent DelToro, "Electrical Engineering Fundamentals", PHI second edition 2011
3.	Edward Hughes, "Electrical Technology,", Pearson Education

COURSE DESIGNERS

1.	Dr. Arun Joseph	Assistant Professor	Robotics and Automation Department
.2.	Mrs. K. Nandhini	Assistant Professor	Robotics and Automation Department
3.	Dr. P. Marishkumar	Assistant Professor	EEE Department

Recommended by Board of Studies	Date: 16.11.2023	Syllabus version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6

231BTC211L	**BIOORGANIC CHEMISTRY LABORATORY**	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	2	0	1

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Marks			Minimum marks for Pass	
	Continuous assessment Examination	End Semester Examination	Maximum marks	End Semester Examination	Total
3	60	40	100	45	50

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	Make the students understand the mechanism of synthesis of different chemical moieties
2.	Familiarize the students with the isolation of biomolecules from natural sources

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:	**Bloom's level**
CO1: Comprehend the mechanism of reactions	K3
CO2: Be able to synthesize various Bioorganic compounds	K3
CO3: Be able to work independently for the experimentation.	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

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

3 – High : 2 - Medium : 1 – Low   : '-' - No correlation

List of experiments: (Any Five Experiments)

1. Synthesis of aspirin

2. Hydrolysis of sucrose

3. Preparation of pyruvic acid from tartaric acid

4. Preparation of oleic acid from tartaric acid

5. Preparation of alpha D- glucopyranose pentaacetate

6. Preparation of 1,2,5,6 dicyclohexylnoine alpha d glucofuranose

7. Isolation of lycopene from tomato paste

8. Preparation of L-proline

9. Preparation of L-cysteine from hair

10. Preparation of S-ethylhydroxyl butonate from methylacetoacetate using yeast

Content beyond the syllabus: (Any one)

1. Resolution of S-ethyl hydroxyl butonate using 3,5 dinitro benzoate.

2. Preparation of 5,10,15,20-tetrakisphenylporphyrin.

TOTAL PERIODS:	**30**

TEXT BOOKS:

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 DESIGNERS

1.	Dr. G. Babu	HOD	Department of Biomedical Engineering
2.	Dr. K. Yamuna Devi	Assistant Professor	Department of Biomedical Engineering
3.	Dr. S. Sathish	Assistant Professor	Department of Biomedical Engineering
4.	Mrs. B. Lakshmi Shree	Assistant Professor	Department of Biomedical Engineering

Recommended by Board of Studies	Date: 11.05.2024	Syllabus version	01
Approved by the Academic Council	Date:	Meeting No.	01

231GES114L	**PYTHON PROGRAMMING LABORATORY**	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	3	1	2

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum Marks for Pass - 50		
	Weightage		Weightage		Overall
	Continuous Assessment Examination	End Semester Examination	Continuous Assessment Examination	End Semester Examination	
3	60 %	40 %	-	45%	50%

COURSE OBJECTIVES:

1.	To impart knowledge on problem solving approaches.
2.	To experiment with programming constructs in Python
3.	To practice various computing strategies for Python-based solutions to real world problems
4.	To use Python data structures - lists, tuples, dictionaries.
5.	To train inbuilding simple project using python.

COURSE OUTCOMES:	Bloom's level
Upon completion of this course, student will be able to:	K4
CO1: Develop algorithmic solutions to simple computational problems	K3
CO2: Implement programs in Python using conditionals and loops for solving problems	K3
CO3: Deploy functions to decompose a Python program	K3
CO4: Process compound data using Python data structures.	K3
CO5: Design python programs for file handling and exception handling.	K3
CO6: Create GUI application for user defined requirement.	K6

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	1	-	-	-	-	2	1	2
CO2	1	2	1	1	1	-	-	-	1	2	1	2
CO3	2	2	1	1	1	-	-	-	1	2	1	2
CO4	2	2	1	1	1	-	-	-	1	2	1	2
CO5	1	3	2	2	1	-	-	-	1	2	1	2
CO6	2	2	2	2	2	-	1	2	3	3	2	3

3 —— High: 2 - Medium: 1 —— Low: ,,-,, - No correlation

	LIST OF EXPERIMENTS	
1.	Identification and solving of simple real life or scientific or technical problems, and developing flow charts, algorithms, and pseudocode for the same. (Electricity Billing / Retail shop billing/ Sin series/ weight of a motorbike/ Weight of a steel bar/ compute Electrical Current in Three Phase AC Circuit, etc.)	
2.	Python programming using simple statements and expressions (exchange the values of two variables/ circulate the values of n variables/ distance between two points).	
3.	Scientific problems using Conditionals and Iterative loops. (Number series/ Number Patterns/ pyramid pattern)	
4.	Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)	
5.	Implementing real-time/technical applications using Sets, Dictionaries. (Language/ components of an automobile / Elements of a civil structure etc.- operations of Sets & Dictionaries)	
6.	Implementing programs using Functions. (Factorial / largest number in a list/ area of shape)	
7.	Implementing programs using Strings. (reverse / palindrome / character count / replacing characters)	
8.	Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)	
9.	Implementing real-time/technical applications using Exception handling. (divide by zero error / voter's age validity / student mark range validation)	
10.	Exploring Pygame tool to Develop a game activity like bouncing ball, car race etc.	
11.	Mini Project (any ONE): Design GUI for • Airline reservation system • Feedback system • Employee management system • Student management system • Banking system	
	TOTAL PERIODS:	**60**

	EXPERIMENTS BEYOND THE SYLLABUS (Any one)
1.	Implementing programs using written modules and Python Standard Libraries - pandas, numpy.
2.	Implementing programs using written modules and Python Standard Libraries - Matplotlib, spicy

COURSE DESIGNERS

1.	Dr.N.Ananthi	Professor & Head	Information Technology
2.	Dr.G.S.Anandha Mala	Professor & Head	Computer Science and Engineering
3.	Mrs.B.Chandra	Assistant Professor	Information Technology
4.	Dr.J.Deepa	Associate professor	Computer Science and Engineering
5.	A.Jeba Sheela	Assistant Professor	Computer Science and Engineering

Recommended by Board of Studies	Date: 20-10-2023	Syllabus Version	1
Approved by the Academic Council	Date: 24-01-2024	Meeting No.	6