SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E- Biomedical Engineering

CURRICULUM and SYLLABI

[For students admitted in 2024-2025]

B.E / B.Tech Regulations 2023

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory Courses										
1.	U23ENG101A	Communication Skills in English	2	0	2	0	3	HS	60	TL
2.	U23MAT102B	Linear Algebra and Multivariable Calculus with MATLAB	3	0	2	0	4	BS	75	TL
3.	U23BM101	Biochemistry	3	0	0	0	3	ES	45	T
4.	U23BM102	Biosciences for Medical Engineering	3	0	0	0	3	ES	45	T
5.	U23PPR105	Problem Solving using Python Programming	3	0	0	0	3	ES	45	T
6.	U23TAM101	தமிழர் மரபு / Heritage of Tamils	1	0	0	0	1	HS	15	T
7.	U23GE101	Basic Aptitude -I	2	0	0	0	0	AC	30	T
Practical Courses										
8.	U23BML103	Biochemistry Laboratory	0	0	2	0	1	ES	30	L
9.	U23PPL112	Python Programming Laboratory	0	0	2	0	1	ES	30	L
10.	U23WPL114	Workshop Practice	0	0	2	0	1	ES	30	L
Total Credits							20			
Optional Language Courses**										
11.	U23OL1101	French	1	0	0	0	1	OL	15	T
12.	U23OL1102	German							15	T
13.	U23OL1103	Japanese							15	T
14.	U23OL1104	Korean							15	T
15.	U23OL1105	Hindi							15	T

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

**Students may opt for foreign languages viz., German/French/Japanese/Korean/Hindi with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, BME BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr.S.Prabakar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ Biomedical Engineering, First Semester B.E.BME Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ENG201A	Technical English	2	0	0	0	2	HS	30	T
2.	U23MAT202B	Transforms and Differential Equations	3	1	0	0	4	BS	60	TT
3.	U23PHY203A	Physics for Biomedical Engineering	3	0	2	0	4	BS	75	TL
4.	U23EGR207	Engineering Graphics	3	0	0	0	3	ES	45	T
5.	U23BM201	Electrical Circuits and Machines for Medical Devices	3	0	0	0	3	ES	45	T
6.	U23BM202	Electronic Circuits for Medical Devices	3	0	0	0	3	ES	45	T
7.	U23TAM201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	1	0	0	0	1	HS	15	T
8.	U23GE201	Basic Aptitude- II	2	0	0	0	0	AC	30	T
Practical courses										
9.	U23BM203	Electrical and Electronics for Medical Devices Laboratory	0	0	2	0	1	ES	30	L
		Total Credits					**21**			
Optional Language Courses**										
10.	U23OL1201	French-II	1	0	0	0	1	OL	15	T
11.	U23OL1202	German-II							15	T
12.	U23OL1203	Japanese-II							15	T
13.	U23OL1204	Korean-II							15	T
14.	U23OL1205	Hindi-II							15	T

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** Students may opt for foreign languages viz., German/French/Japanese/Korean/Hindi with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	**Chairperson, BME BoS**	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.M.Renuga	**Dr.S.Prabakar**	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/ Biomedical Engineering, Second Semester B.E. BME Students and Staff, COE

BME III

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23MAT301D	Probability and Statistics	3	1	0	0	4	BS	60	TT
2.	U23BM301	Transducers and Biosensors	3	0	0	0	3	PC	45	T
3.	U23BM302	Signals and Systems for Biomedical Applications	2	1	0	0	3	PC	45	TT
4.	U23BM303	Radiation Physics and Biophotonics	3	0	0	0	3	PC	45	T
5.	U23BM304	Anatomy and Human Physiology	3	0	0	0	3	PC	45	T
6.	U23BM305	Biomaterials	3	0	0	0	3	PC	45	T
7.	**noc25-mg106**	NPTEL Design Thinking - A Primer	1	0	0	0	1	ES	15	T
8.	U23GE302	**Audit Course**: Environment and Climate Science	2	0	0	0	0	AC	30	T
Practical courses										
9.	U23BM306	Anatomy and Human Physiology Laboratory	0	0	2	0	1	PC	30	L
10.	U23BM307	Transducers and Biosensors Laboratory	0	0	2	2	2	PC	60	LP
11.	U23GE301	Soft Skills and Aptitude-I	0	0	2	0	1	EEC	30	L
							Total Credits	24		

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson, Biomedical Engineering BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.S.Prabakar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Biomedical Engineering, Third Semester B.E. BME Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory Courses										
1	U23BM401	Integrated Circuits for Medical System	3	0	0	0	3	PC	45	T
2	U23BM402	Pathology and Microbiology	3	0	0	0	3	PC	45	T
3	U23BM403	Biocontrol System	3	1	0	0	4	PC	60	TT
4	U23BM404	Biomechanics	3	0	0	0	3	PC	45	T
5	U23BM405	Telemedical System	3	0	0	0	3	PC	45	T
6	U23GE402	**Audit Course**: Essence of Indian Traditional Knowledge	2	0	0	0	0	AC	30	T
Practical Courses										
7	U23BM406	Integrated Circuits for Medical System Laboratory	0	0	3	0	1.5	PC	45	L
8	U23BM407	Pathology and Microbiology Laboratory	0	0	3	0	1.5	PC	45	L
9	U23BM408	Biosignal, Data Processing with C Programming	1	0	4	0	3	PC	75	LT
10	U23GE401	Soft Skills and Aptitude – II	0	0	2	0	1	EEC	30	L
Total Credits							23			

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Approved By

Chairperson, Biomedical Engineering BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.S.Prabakar	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Biomedical Engineering, Fourth Semester B.E. BME Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory Courses										
1.	U23ENG101A	Communication Skills in English	2	0	2	0	3	HS	60	TL
2.	U23MAT102B	Linear Algebra and Multivariable Calculus with MATLAB	3	0	2	0	4	BS	75	TL
3.	U23BM101	Biochemistry	3	0	0	0	3	ES	45	T
4.	U23BM102	Biosciences for Medical Engineering	3	0	0	0	3	ES	45	T
5.	U23PPR105	Problem Solving using Python Programming	3	0	0	0	3	ES	45	T
6.	U23TAM101	தமிழர் மரபு / Heritage of Tamils	1	0	0	0	1	HS	15	T
7.	U23GE101	Basic Aptitude -I	2	0	0	0	0	AC	30	T
Practical Courses										
8.	U23BML103	Biochemistry Laboratory	0	0	2	0	1	ES	30	L
9.	U23PPL112	Python Programming Laboratory	0	0	2	0	1	ES	30	L
10.	U23WPL114	Workshop Practice	0	0	2	0	1	ES	30	L
Total Credits							20			
Optional Language Courses**										
11.	U23OL1101	French	1	0	0	0	1	OL	15	T
12.	U23OL1102	German							15	T
13.	U23OL1103	Japanese							15	T
14.	U23OL1104	Korean							15	T
15.	U23OL1105	Hindi							15	T

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**Students may opt for foreign languages viz., German/French/Japanese/Korean/Hindi with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, BME BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr.S.Prabakar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

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U23ENG101A	Communication Skills in English (Common to ADS, AIML, BME, CSD, CSE, CIVIL, ECE, EEE, MCT, FT, IT Branches)	L	T	P	J	C
		2	0	2	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use grammatical components effectively in both written and spoken communication
CO2:	Develop speaking skills for self-introduction, delivering speeches and technical presentation
CO3:	Demonstrate effective listening skills for academic and professional purposes
CO4:	Write emails and formal letters and build resumes and construct paragraphs
CO5:	Develop speaking skills both in terms of fluency and comprehensibility

Pre-requisite:

- Knowledge and Understanding of Grammar
- Fundamental Language Skills (LSRW)

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	3	3	2	3	3	2	3	2	3
CO2	1	1	1	1	1	3	3	3	3	3	3	3	3	3
CO3	1	2	3	2	2	3	3	2	3	3	3	3	3	3
CO4	1	2	1	2	2	3	3	3	3	3	3	3	3	3
CO5	1	2	2	3	2	3	3	3	3	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) CIE test IV (10) (Practical) Assignment/seminar/Quiz (5)	Attendance (5) Total CIE: 50 marks Semester End Examination (50) (SEE – Theory (25 marks + Lab (25 marks)	Course end survey

Unit 01: **6 Hours**

- General vocabulary, Parts of Speech, Articles
- Email, fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – Describing – defining – providing examples or evidences

Unit 02:	6 Hours
• Tenses, Sentence Patterns • Instructions • Letter Writing - calling for quotations, placing orders	
Unit 03:	**6 Hours**
• Prefixes and Suffixes • Cover letter and resume writing	
Unit 04:	**6 Hours**
• Modal verbs, concord • Checklist • Letter Writing - Business communication, complaints, replies to queries from business customers	
Unit 05:	**6 Hours**
• If conditionals • Letter Writing - inviting dignitaries, accepting and declining invitations	

Lab component:

1. Self-introduction, personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
2. Mini presentation - Office Arrangements, Facilities, Office Functions, Sales, Purchases, Training Recruitment, Advertising, Applying for financial assistance, applying for a job.
3. Listening - understanding short conversations or monologues, taking down phone messages, orders, notes, etc.
4. Listening – entering information in tabular form
5. Loud Reading

Theory: 30 Hrs	Tutorial: --	Practical: 30 hours-	Project:--	Total Hours: 60 Hrs

TEXT BOOKS

1.	Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016
2.	**Extensive Reading** 1. She is Dancing Back to Life – A Short Story" 2. The Story of Google – Sara Gilbert, published by Jaico 3. The Story of Amazon.com- Sara Gilbert, published by Jaico

REFERENCES

1.	Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2.	A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

HOD

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 6

B. E. / BIOMEDICAL ENGINEERING						
SEMESTER - I	LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS WITH MATLAB	L	T	P	J	C
U23MAT102B		3	0	2	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	apply the concepts of vector spaces and linear transformations in real world applications
CO2:	apply the concepts of eigenvalues and eigenvectors of a real matrix and their properties to diagonalize the matrix.
CO3:	find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
CO4:	apply appropriate techniques of multiple integrals to find the area and volume
CO5:	apply the concepts of vector differentiation and integration to find the area and volume.

Pre-requisites:

- Fundamentals of elementary algebra
- Fundamentals of calculus
- Fundamentals of geometry
- Fundamentals of trigonometry

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3								2	3	
CO2	3	3		3								2	3	
CO3	3	3		3								2	3	
CO4	3	3		3								2	3	
CO5	3	3		3								2	3	

Course assessment methods [Theory with laboratory course]

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) CIE test IV (10) (Practical) Attendance (5) Assignment/Quiz/Seminar (5)	Total CIE: 50 marks Semester End Examination (50) [SEE- Theory (35) + Lab(15) marks]	Course end survey

Unit 01	VECTOR SPACES	9 Hours

Vector space – linear independence and dependence of vectors – basis – dimension – linear transformations (maps) – matrix associated with a linear map – range and kernel of a linear map.

Unit 02	EIGENVALUES AND EIGENVECTORS	9 Hours

Eigenvalues and eigenvectors of real matrices – properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – diagonalization of real symmetric matrices.

Unit 03	FUNCTIONS OF SEVERAL VARIABLES	9 Hours

Functions of several variables – partial differentiation – total derivative – Jacobians – Taylor's theorem for functions of two variables – maxima and minima of functions of two variables without constraints – constrained maxima and minima by Lagrange's method of undetermined multipliers.

Unit 04	MULTIPLE INTEGRALS	9 Hours
Double integrals – change of order of integration – change of variables from Cartesian to polar coordinates – area as double integrals in Cartesian coordinates – triple integrals – volume as triple integrals in Cartesian coordinates.		
Unit 05	**VECTOR CALCULUS**	**9 Hours**
Vector differentiation: Scalar and vector valued functions – gradient, directional derivative, divergence and curl – scalar potential. **Vector integration:** Line, surface and volume integrals – statement of Green's, Stoke's and Gauss divergence theorems – simple applications involving squares, rectangles, cubes and rectangular parallelopiped.		

	List of MATLAB Programs
1.	Programs based on elementary operations on matrices
2.	Computing the rank of a matrix
3.	Finding eigenvalues and eigenvectors of a matrix
4.	Finding partial derivatives of functions of several variables
5.	Computing stationary points of functions of two variables
6.	Taylors series expansion of functions of two variables
7.	Evaluating double integrals
8.	Finding area as double integrals
9.	Evaluating triple integrals
10.	Finding volume as triple integrals

Theory: 45 Hrs	Tutorial: -	Practical: 30 Hrs	Project:--	Total Hours: 75 Hrs

TEXT BOOKS:

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.
3. W. Yang, Y. K. Choi, K. Jaekwon, M. C. Kim, H. J. Kim and T. Im, "Engineering Mathematics with MATLAB", CRC Press Publishers, 1st Edition, 2017.

REFERENCE BOOKS:

1. S. Lipschutz and M. L. Lipson, "Linear Algebra", McGraw Hill Publishers, 6th Edition, 2018.
2. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
3. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.
6. D. Xu, "Calculus problem solutions with MATLAB", Walter de Gruyter Publishers, 1st Edition, 2020.

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SALEM - 6

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U23BM101	BIOCHEMISTRY	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

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

CO1	•	Outline the fundamentals of Biochemistry.
CO2	•	Illustrate the Qualitative analysis of Enzymes and Biomolecules.
CO3	•	Explain the various disorders of metabolism in the human body.
CO4	•	Summarize the working principle of Centrifuge and its applications
CO5	•	Classify the various techniques involved in biochemical analysis.

CO/PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CO2	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CO3	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CO4	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CO5	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-

UNIT I	FUNDAMENTALS TO BIOCHEMISTRY	9

Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Handerson - Hasselbalch equation, Buffer system of Human Body. Properties of water and their applications in biological systems.

UNIT II	MOLECULAR ANALYSIS AND ENZYMES	9

Introduction to Carbohydrates-Amino Acids and Proteins- Nucleic Acids and Lipids-Nature of Bonding and Qualitative Tests-Classification and Nomenclature of Enzymes-Co-Factors-Importance of Enzymes.

UNIT III	DISORDERS OF METABOLISM	9

Disorders of Carbohydrate Metabolism: Diabetes Mellitus, Hypoglycemia and Glycogen Storage diseases. Disorders of Lipid Metabolism: Hyperlipidemia, Hyperlipoproteinemia and Hypercholesterolemia. Disorders of amino acid Metabolism: alkaptonuria, Phenylketonuria and aminoaciduria.

UNIT IV	CENTRIFUGATION AND ITS APPLICATIONS	9
Basic principles of sedimentation, Svedberg's constant, sedimentation velocity and sedimentation equilibrium. Types of centrifuges – desktop, high speed and ultracentrifuges. Types of Rotors - swinging bucket, fixed angle, vertical tube and zonal rotor. Types of centrifugation: Preparative centrifugation - differential and density gradient centrifugation with applications, Analytical centrifugation – molecular weight determination.		

UNIT V	BIOCHEMICAL ANALYZERS	9
Chromatographic Techniques: Principles, procedure and applications of paper chromatography, thin layer chromatography. Electrophoretic Techniques: Principles, techniques and applications of gel electrophoresis - agarose, SDS- PAGE. Spectroscopic Techniques: Principles, instrumentations and applications of colorimeter, spectrophotometer.		

TOTAL : 45 Hours

TEXTBOOKS:

1. Keith Wilson & John Walker, "Practical Biochemistry - Principles & Techniques", Oxford University Press, 2009.
2. Avinash Upadhyaye and Nirmalendhe Nath, "Biophysical Chemistry-Principles and Techniques" Himalaya Publishing House, 2009

REFERENCES:

1. Keith Wilson and Kenneth Goulding, "A Biologist Guide to Principles and Techniques of Biochemistry" Edward Arnold publishers, 1986..
2. Rafi M D "Text book of biochemistry for Medical Student" Fourth Edition, Universities Press, Orient Blackswan Private Limited - New Delhi 2021.

ACADEMIC COORDINATOR
K.Manikandan
Asst Prof /BME

BOS-CHAIRMAN
BME

Dr.S.PRABAKAR M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

U23BM102	BIOSCIENCES FOR MEDICAL ENGINEERING	L	T	P	J	C
		3	0	0	0	3

COURSE OUTCOMES

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

CO1	•	Analyze the cell growth and structure
CO2	•	Know about various types of metabolism in living organisms.
CO3	•	Understand the thermal and energy properties of the human body
CO4	•	Explain the various electrical and magnetic properties of the body tissue
CO5	•	Describe about characteristic flow dynamics involved in the body fluids.

CO/PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	-	-	-	-	-	-	1	-	-	-
CO2	2	-	-	1	-	-	-	-	-	-	-	1	-	-	-
CO3	2	-	-	1	-	-	-	-	-	-	-	1	-	-	-
CO4	2	-	-	1	-	-	-	-	-	-	-	1	-	-	-
CO5	2	-	-	1	-	-	-	-	-	-	-	1	-	-	-

UNIT I **THE BASIC UNIT OF LIFE** **9**

Cell- Basic Properties of Cells- Prokaryotic Cells- Eukaryotic Cells- Cell Cycle and Cell Division- M Phase- Meiosis- Cell Differentiation.

UNIT II **METABOLISM** **9**

Metabolism and Its Concepts- Metabolic Basis for Living – Types: Anabolic and Catabolic Pathways. Cellular Respiration- Types: Aerobic and Anaerobic Respiration- Phases of Respiration in Organisms: Glycolysis, Oxidative Phosphorylation and TCA Cycle.

UNIT III **THERMAL & ENERGY PROPERTIES OF THE BODY** **9**

Conservation of Energy and Heat Flow- Energy Content of Body Fuel- Energy Storage- Energy Storage Molecules- Metabolic Rates- Basal Metabolic Rate- Mechanical Work and Power- Loss of Body Heat- Introduction to Modes of Heat Loss.

UNIT IV	ELECTRICAL AND MAGNETIC PROPERTIES OF THE BODY	9
Review of Electrical Properties- Electrical Properties of Body Tissues- Electrical Conduction Through Blood and Tissues- Ion Channels, Hair Cells, Balance, Taste, and Smell- Magnetic Properties- Magnetic Field from an Axon- Magnetic Sense.		

UNIT V	PROPERTIES OF BODY FLUIDS	9
Characteristic Pressures in the Body- Definition and Units- Measuring Pressure- Basic Physics of Pressure and Flow of Fluids- Fluids in Motion- Equation of continuity -Bernoulli's Equation- Resistance in Flow: Viscous Flow and Poiseuille's Law-Compliance in Flow-Flow under Special Conditions-Diffusion-Pressure and Flow in the Body-Motion of Humans in Fluids		

TOTAL : 45 Hours

TEXTBOOKS:

1. Rafi MD "Text book of biochemistry for Medical Student" Fourth Edition, Universities Press, Orient Blackswan Private Limited - New Delhi 2021.
2. Murray. R.K., et al "Harper's Illustrated Biochemistry", 27th Edition, McGraw-Hill, 2006.
3. Irving P. Herman "Physics of the Human Body" Second Edition, Springer 2015.

REFERENCES:

1. Satyanarayana, U. and U. Chakerapani, "Biochemistry" 3rd Rev. Edition, Books & Allied (P) Ltd., 2006
2. Krishna B. Chandran, Ajit P. Yoganathan and Stanley E. Rittgers, Biofluid Mechanics: The Human Circulation, Taylor and Francis, 2007.

ACADEMIC COORDINATOR
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U23BML103	BIOCHEMISTRY LABORATORY	L	T	P	J	C
		0	0	2	0	1

COURSE OUTCOMES

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

CO1	•	Understand the Biochemistry laboratory functional components.
CO2	•	Illustrate the Qualitative analysis of Biomolecules.
CO3	•	Perform various techniques involved in biochemical analysis.

CO/PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CO2	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-
CO3	2	-	-	1	-	-	-	-	-	-	-	-	1	-	-

LIST OF EXPERIMENTS:

1	Preparation of solutions: 1) Percentage solutions, 2) Molar solutions, 3) Normal solutions.
2	Qualitative Analysis of Carbohydrates- Benedict's Test and Fehling's Test.
3	Qualitative Analysis of Proteins - Ninhydrin test and Biuret Test.
4	Qualitative Analysis of Lipids - Solubility Test and Saponification test.
5	Qualitative Analysis of Amino Acids - Xanthoproteic Test and Millon's Test.
6	Measurement of pH of solutions using pH meter.
7	Determination of percentage Transmittance, Absorbance, and concentration of given Solution using a spectrophotometer.
8	Biochemical Analysis using Paper Chromatography.
9	Determine the concentration of a colored compound using a Colorimeter.
10	Separation of proteins by SDS electrophoresis.

TOTAL: 30 PERIODS

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U23PPR105	PROBLEM SOLVING USING PYTHON PROGRAMMING (Common to ADS, IT, CSE, CSE(AIML), CSD, CIVIL, BME, ECE, EEE, MECH and MCT Branches)	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Develop algorithmic solutions to simple computational problems
CO2:	Write simple Python programs
CO3:	Write programs with the various control statements and handling strings in Python
CO4:	Develop Python programs using functions and files
CO5:	Analyze a problem and use appropriate data structures to solve it.

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	1									1
CO2	2	2	3	1	1									1
CO3	2	2	3	1	1									1
CO4	2	2	3	1	1									1
CO5	2	2	3	1	1									1

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Assignment/seminar/Quiz (5)	Objectives Test (6) Attendance (5) Total CIE: 40 marks Semester End Examination (60)	Course end survey

Unit 01: ALGORITHMIC PROBLEM SOLVING — **9 Hours**

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

Unit 02: BASICS OF PYTHON PROGRAMMING — **9 Hours**

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

Unit 03: CONTROL STATEMENTS AND STRINGS — **9 Hours**

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

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Unit 04: FUNCTIONS, FILES AND MODULES	9 Hours
Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local scope, global scope and recursion. Files -Text files, reading and writing files. Modules – create – import.	
Unit 05: DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES	**9 Hours**
Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries, Union Operation.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Reema Thareja, "Problem Solving and Programming with Python" Oxford University Press, 2nd Edition 2023.

REFERENCES

1.	Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" Mc-Graw Hill Education, 2018.
2.	Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus" Wiley India Edition, 2013.
3.	Allen Downey, "Think Python: How to Think Like a Computer Scientist" O'Reilly Media, 2nd Edition 2016.
4.	Timothy A. Budd," Exploring Python" Mc-Graw Hill Education (India) Private Ltd., 2015.

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U23PPL112	PYTHON PROGRAMMING LABORATORY (Common to ADS, IT, CSE, CSE(AIML), CSD, CIVIL, BME, ECE, EEE, MECH and MCT Branches)	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Implement the algorithms using basic control structures in Python
CO2:	Develop Python programs to use functions, strings and data structures to solve different types of problems
CO3:	Implement persistent storing information through file operations

Pre-requisite: NIL

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	1								1
CO2	3	3	3	3	2	2								1
CO3	3	3	3	3	2	2								1

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

LIST OF EXPERIMENTS

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Implement python program to perform operations on file and module.
9. Develop python programs to perform operations on list and tuples.
10. Implement dictionary and set in python.

Theory: --	Tutorial: --	Practical: 30Hrs	Project: --	Total Hours: 30 Hs

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U23WPL114	WORKSHOP PRACTICE	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Perform the various techniques of sheet metal fabrication.
CO2:	Analyse various techniques of welding and carpentry works.
CO3:	Solve the real-time problems using sheet metal, welding and carpentry.

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1							3				2	2	
CO2	1							3				2	2	
CO3	1							3				2	2	

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I- (5) CIE test II (15) Quiz II- (5)	RTPS (10) Record (10) Total CIE: 60 marks Semester End Examination (40 marks)	Course end survey

Importance of workshop practice- Introduction to Measuring and marking devices, Tools and equipment Maintenance - Workshop apparatus - Human safety practices - First aid procedures. **(Not for Examination)**

LIST OF EXPERIMENTS

SECTION 1:	**SHEET METAL** Making of Cone, Dust Pan and Funnel.	8 hours
SECTION 2:	**WELDING** Arc welding of Butt joint and Lap Joint.	8 hours
SECTION 3:	**CARPENTRY** Making of Half Lap joint and Dovetail Joint.	8 hours
Demonstration:	**FOUNDRY PRACTICES** Simple pattern making	6 hours

Total Number of hours: 30

Theory: 0	Tutorial: 0	Practical: 30 Hrs	Project: 0	Total Hours: 30 Hrs

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U23TAM101	தமிழர் மரபு / Heritage of Tamils	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe Tamil Language and Literature
CO2:	Analyse Heritage - Rock Art Paintings To Modern Art – Sculpture
CO3:	Explain Folk and Martial Arts
CO4:	Describe Thinai Concept of Tamils
CO5:	Analyse Contribution of Tamils to Indian National Movement and Indian Culture

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

அலகு 1 : மொழி மற்றும் இலக்கியம்	3 Hours

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

அலகு 2 : மரபு – பாறை ஓவியங்கள் முதல் ஓவியங்கள் வரை – சிற்பக் கலை	3 Hours

நடுகல் முதல் சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை- சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு

அலகு 3: நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3 Hours

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோலபாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4: தமிழர்களின் திணைக் கோட்பாடுகள்	3 Hours

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் -

சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.				
அலகு 5: இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு				**3 Hours**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள் கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.				
Theory: 15 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 15 Hrs**

REFERENCES

1	தமிழக வரலாறு – மக்களும் பண்பாடு – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் - முனைவர் இல.சுந்தரம்.(விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை –ஆற்றங்னரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (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.

HOD

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U23TAM101	தமிழர் மரபு / Heritage of Tamils	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe Tamil Language and Literature
CO2:	Analyse Heritage - Rock Art Paintings To Modern Art – Sculpture
CO3:	Explain Folk and Martial Arts
CO4:	Describe Thinai Concept of Tamils
CO5:	Analyse Contribution of Tamils to Indian National Movement and Indian Culture

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: **LANGUAGE AND LITERATURE**	3 Hours
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan..	
Unit 02: **HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	3 Hours
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils	
Unit 03: FOLK AND MARTIAL ARTS	**3 Hours**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils	
Unit 04: THINAI CONCEPT OF TAMILS	**3 Hours**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	
Unit 05: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	**3 Hours**
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	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	தமிழக வரலொறு – மக்களும் பண் பொடும் – மக.மக. பிள்மள (தவளியீடு: தமிழ்நொடு பொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித ் தமிழ் – முமனவர ்இல. சுந்தரம் . (விகடன் பிரசுரம்).

3	கீழடி – மவமக நதிக்கமரயில் ெங்ககொல நகர நொகரிகம் (ததொல்லியல் துமறதவளியீடு)
4	பொருமந – ஆற்றங்கமர நொகரிகம். (ததொல்லியல் துமற தவளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
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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.

HOD

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U23GE101	BASIC APTITUDE-1	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Solve the problems in Divisibility , Division algorithm ,Successive Division and HCF & LCM. Identify Synonyms and Antonyms.
CO2:	Elucidate the problems in BODMAS rule, Approximation, Surds and Indices, Algebraic Simplification and Square root and Cube root. Choose appropriate Verbal Analogies and edit the given passages.
CO3:	Crack the problems involving Ratio and Proportion, and discuss Proportionality Theorems. Comprehend the given passages for Reading Comprehension activity and answer the questions correctly.
CO4:	Deduce the problems involving Linear equation and Quadratic equation. Demonstrate good vocabulary skill by doing the one word substitution and sentence filler exercise with high degree of accuracy.
CO5:	Interpret the logical reasoning problems from Number series ,Coding and Decoding and Exhibit good expertise in detecting errors in the given sentences.

Pre-requisite:

- Basic English language and Grammar knowledge
- Knowledge in Basic Mathematics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO 11	PO12
CO1	3	3	3	2	1	1	1	3	3	3	2	3
CO2	3	3	3	2	1	1	1	3	3	3	2	3
CO3	3	3	3	2	1	1	1	3	3	3	2	3
CO4	3	3	3	2	1	1	1	3	3	3	2	3
CO5	3	3	3	2	1	1	1	3	3	3	2	3

Course Assessment methods

Direct		Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40) – Theory	Total CIE: 100 marks Semester End Examination – NIL	Course end survey

Unit 01	6 Hours
Number Properties: Classification of numbers - Divisibility - Division algorithm -Successive Division - HCF and LCM –Problems Verbal Aptitude: Synonyms and b. Antonyms	
Unit 02	**6 Hours**
Simplification: BODMAS Rule - Approximation - Surds and Indices - Algebraic Simplification - Square root and Cube root – Problems Verbal Aptitude: Verbal analogy, Editing passages	
Unit 03	**6 Hours**
Ratio and Proportion : Ratio - Properties of Ratios - Compound Ratio - Coin based problems - Proportion - Proportionality Test - Proportionality Theorems - Inverse Proportion - Variation - Problems Verbal Aptitude: Reading Comprehension	
Unit 04	**6 Hours**
Equations: a. Linear equation: Simultaneous Linear Equations - Consistent System - Inconsistent System - Problems b. Quadratic Equation: Different Ways to Express the Quadratic Equation - Discriminant of the Quadratic Equations - Roots - Nature of the Roots - Relation between roots and coefficient of equation - Formation of a Quadratic Equation – Problems Verbal Aptitude: One word substitution , Sentence filler words	
Unit 05	**6 Hours**
Logical Reasoning : Number series – Coding and Decoding – Problem Verbal Aptitude: Error detection	

Theory: 30 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 30 Hrs

TEXT BOOKS

1. S.Chand and Dr.R.S.Aggarwal, "Quantitative Aptitude for competitive examinations", S Chand and Company Limited 2019.
2. Nishit K.Sinha, "Logical Reasoning and Data Interpretation", Pearson 2021.

15/09/2023

Dr.S.Anita

Head/Training

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U23OL1101	French	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Read French phrases, Spell French phonitis, practice French accents, differentiate French and English sounds
CO2:	Introduce oneself, talk about someone, ask others personal information, identify an object, ask and respond politely in a conversation
CO3:	Read and write a small annoncement, describe about neighbours, write a small portrait
CO4:	Express one's wishes, talk about one's hobbies, ask time, describe one's status of life in a blog, justify a choice, express one's preferences, write a list of needs
CO5:	Suggest to do something, appreciate something, talk about a movie, write a postal card

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 2: Alphabets, Basic wishes, self-introduction, basic verbs: avoir and être Hr 4: Nationalities and countries, colors, days & months Hr 6: Definite articles, numbers 0-20, write about one's identification	
Unit 02:	**3 Hours**
Hr 8: Professions, conjugation: 1st group verbs, indefinite articles Hr 10: Preposition of place, identity card, negative sentence Hr 12: Things around us, subjective and ephatitic pronouns, self-introduction online	
Unit 03:	**3 Hours**
Hr 14: Talk about accommodation, conjugation: aller and venir, possessive adjectives Hr 16: Adjective's gender, noun's gender, things in a room, simple prepositions Hr 18: Physical description, speak about accommodation, writing a self-potrait	
Unit 04:	**3 Hours**
Hr 20: Hobbies, conjugation: vouloir, pouvoir and devoir, connected articles Hr 22: Interrogative adjectives, daily activities, time and seasons, pronominal verbs Hr 24: Near future tense, talk about preferences, write a mail	
Unit 05:	**3 Hours**
Hr 26: Outing activities, conjugation: faire and sortir, demonstrative adjectives Hr 28: Adverbs of frequency, family members, past tenses (passé composé and imparfait) Hr 30: French arts, talk about a film, and write a postal card	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide relevant audios, videos, handouts and notes
2.	Books : Saison (Méthode de français, cachier d'activités)
3.	Reference books : La conjugaison, Dondon, Echo

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U23OL1102	German	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use common, everyday expressions to greet others and introduce themselves.
CO2:	Construct simple sentences /questions.
CO3:	Initiate and sustain basic conversation based on family, professions,
CO4:	Hobbies and food.
CO5:	Identify differences in using nouns based on gender.

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
• Greeting and taking leave, introducing oneself, introducing others	
Unit 02:	**3 Hours**
• Alphabets, spelling, numbers	
Unit 03:	**3 Hours**
• Age, Telephone/mobile numbers, Month, Date, Time	
Unit 04:	**3 Hours**
• Languages, Family, Asking/giving information about family members	
Unit 05:	**3 Hours**
• Hobbies, Professions	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	Netzwerk A1

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U23OL1103	Japanese	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use words and phrases of greeting in Japanese, write the letters of the alphabet, identify names of objects and do a self-introduction using short and simple sentences
CO2:	Demonstrate the use of time-related words and verb conjunctions and make light conversation asking for directions and answering questions
CO3:	Use different kinds of verbs through the day and those used for giving things, and demonstrate the use of adjectives
CO4:	Express liking for the Japanese language, describe the locations of different things and demonstrate counting in Japanese
CO5:	Make comparisons of stated things, express a willingness to go to Japan and use 'Te-form' verbs

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 1-2: Greeting words and phrases; the Japanese alphabet: 104 Hiragana and 104 Katakana letters Hr 3-4: Identifying words from pictures or objects shown Hr 5-6: Self-introduction	
Unit 02:	**3 Hours**
Hr 7-8: Asking for directions when shopping Hr 9-10: Time words and Verb Conjugations Hr 11-12: Making light conversation	
Unit 03:	**3 Hours**
Hr 13-14: Expressions to use verbs from morning to night Hr 15-16: Verbs used for giving things Hr 17-18: Adjectives	
Unit 04:	**3 Hours**
Hr 19-20: Ways to show liking for the Japanese language Hr 21-22: Describing the location of things (or where things are) Hr 23-24: Japanese numbers and counting	
Unit 05:	**3 Hours**
Hr 25-26: Making comparisons Hr 27-28: Expressions wishing for something, like 'I want to go to Japan …!' Hr 29-30: Using 'Te-form' Verb	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide handouts / notes / course material.
2.	Books on Basic Japanese language available in the college library.

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U23OL1104	Korean	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use single vowels and consonants syllable structure.
CO2:	Greet others and introduce themselves.
CO3:	Identify time , date and week
CO4:	Explain location and places
CO5:	Construct simple sentences / questions.

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: Hangeul	3 Hours
Single Vowels & Consonants Syllable Structure Tense Consonants Aspirated Consonants Double Vowels Final Consonants Double Final Consonants Liaison	
Unit 02: Introduction	3 Hours
Greetings Talking about names Self-introduction Introducing my family members	
Unit 03: Time and Date	**3 Hours**
Talking about location Talking about dates and days of the week Talking about doing something in the past	
Unit 04: Location and Places	**3 Hours**
Talking about location Talking about doing something at a location Talking about directions	
Unit 05: Future	**3 Hours**
Talking about doing something in the future Talking about plans for the future Talking about hope for the future	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	Vitamin Korean - 1

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U23OL1105	Hindi	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the students will be able to

CO1:	Write स्वर(अ - अः), व्यंजन(क - श्र)
CO2:	Identify and write बारहखडी(क - श्रः)
CO3:	Coin 2,3&4 letters words
CO4:	Read and frame sentences (grammar, verb, noun, pronoun, adjective, etc…)
CO5:	Communicate effectively using tenses (with Continuous)

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: स्वर (अ - अः), व्यंजन (क - श्र)	3 Hours
Hindi letters learning Letters identification Reading Writing Letters pronunciation	
Unit 02: बारहखडी (क - श्रः)	3 Hours
Hindi letters learning Letters identification Reading Writing Letters pronunciation	
Unit 03: 2,3 & 4 letters words	**3 Hours**
Words making Words meaning Reading & Writing	
Unit 04 : Grammar, (Verb, noun, pronoun, adjective, etc…)	**3 Hours**
Words meaning Reading & Writing Sentence framing	
Unit 05 : Tenses (with Continuous)	**3 Hours**
Talking about school Talking about family, friends Talking about doing something in the past, present, future Translation	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	Diploma in Hindi (department of higher education, Delhi)

HOD

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23ENG201A	Technical English	2	0	0	0	2	HS	30	T
2.	U23MAT202B	Transforms and Differential Equations	3	1	0	0	4	BS	60	TT
3.	U23PHY203A	Physics for Biomedical Engineering	3	0	2	0	4	BS	75	TL
4.	U23EGR207	Engineering Graphics	3	0	0	0	3	ES	45	T
5.	U23BM201	Electrical Circuits and Machines for Medical Devices	3	0	0	0	3	ES	45	T
6.	U23BM202	Electronic Circuits for Medical Devices	3	0	0	0	3	ES	45	T
7.	U23TAM201	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	1	0	0	0	1	HS	15	T
8.	U23GE201	Basic Aptitude- II	2	0	0	0	0	AC	30	T
Practical courses										
9.	U23BM203	Electrical and Electronics for Medical Devices Laboratory	0	0	2	0	1	ES	30	L
		Total Credits					21			
Optional Language Courses**										
10.	U23OL1201	French-II	1	0	0	0	1	OL	15	T
11.	U23OL1202	German-II							15	T
12.	U23OL1203	Japanese-II							15	T
13.	U23OL1204	Korean-II							15	T
14.	U23OL1205	Hindi-II							15	T

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

** Students may opt for foreign languages viz., German/French/Japanese/Korean/Hindi with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	**Chairperson, BME BoS**	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.M.Renuga	**Dr.S.Prabakar**	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/ Biomedical Engineering, Second Semester B.E. BME Students and Staff, COE

U23ENG201A	Technical English (Common to ADS, AIML, BME, CSD, CSE, CIVIL, ECE, EEE, MCT, FT, IT, EXE, EFE Branches)	L	T	P	J	C
		2	0	0	0	2

Course Outcomes

At the end of the course, the student will be able to

CO1:	Frame sentences correctly, both in written and spoken forms of language with accuracy and fluency
CO2:	Develop effective reading skills and reinforce language skills required for using grammar and building vocabulary
CO3:	Organise ideas and supporting arguments logically
CO4:	Develop skills for writing conversations, proposals, reports and transcoding
CO5:	Read for understanding and interpreting information and to utilise information accordingly

Pre-requisite:

- Knowledge and Understanding of Grammar
- Fundamental Language Skills (LSRW)

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	3	2	3	3	3	3	3	3	3	3	3
CO2	2	2	2	3	2	3	3	3	3	3	3	3	3	3
CO3	3	2	2	3	2	3	3	3	3	3	3	3	3	3
CO4	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7) Assignment/seminar/Quiz (5)	Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: **6 Hours**

- Comparative adjectives
- Recommendations
- Guided writing – Conversation in workplace context
- Reading passages for specific information transfer

Unit 02:	6 Hours
• Prepositions, adverbs • Note making • Reading passage with multiple choice questions, reading for gist and reading for specific information	
Unit 03:	**6 Hours**
• Collocations, direct and indirect speech • Memo • Proposal: establishing a lab, introducing a subject in the curriculum, training programme for students • Short reading passage: gap-filling exercise related to grammar	
Unit 04:	**6 Hours**
• Cause and effect • Technical report writing – feasibility report, accident report, survey report • Short reading passages for sentence matching exercises, picking out specific information in a short text	
Unit 05:	**6 Hours**
• Active, passive and impersonal passive voices • Transcoding – bar chart, pie chart, tabular column, graph, flow chart	

Theory: 30 Hrs	Tutorial: --	Practical: -	Project:--	Total Hours: 30 Hrs

TEXT BOOKS

1.	Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016
2.	**Extensive Reading** 1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons 2. Discover the Diamond in You – Arindham Chaudhari – Vikas Publishing House Pvt. Ltd.

REFERENCES

1.	Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2.	A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

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SEMESTER - II	TRANSFORMS AND DIFFERENTIAL EQUATIONS (Common to EEE, ECE, BME, EFE and EXE)	L	T	P	J	C
U23MAT202B		3	1	0	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	apply the classical methods to solve linear ordinary differential equations with constant coefficients.
CO2:	apply the Laplace transforms technique and its properties to solve ordinary differential equations.
CO3:	express a periodic signal as an infinite sum of sine and cosine wave components using Fourier series.
CO4:	apply the Fourier transform techniques to convert the signal in terms of the frequencies of the waves.
CO5:	find the general and singular solutions of linear and nonlinear partial differential equations.

Pre-requisites:

- Fundamentals of elementary algebra
- Fundamentals of calculus
- Fundamentals of trigonometry
- Fundamentals of geometry

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1 (EEE,ECE EFE, EXE)	PSO2 (EEE, BME & EFE)	PSO3 (BME)
CO1	3	3	3	3	2							2	3	3	1
CO2	3	3	3	3	2							2	3	3	1
CO3	3	3	3	3	2							2	3	3	1
CO4	3	3	3	3	2							2	3	3	1
CO5	3	3	3	3	2							2	3	3	1

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01	ORDINARY DIFFERENTIAL EQUATIONS	12 Hours

Higher order linear ordinary differential equations with constant coefficients – Cauchy's and Legendre's linear ordinary differential equations – Method of variation of parameters.

Unit 02	LAPLACE TRANSFORMS	12 Hours
Laplace transform: Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse function – Initial and final value theorems – Transform of periodic functions. **Inverse Laplace transform:** Standard results – Statement of convolution theorem and its applications – Solution of second order linear ordinary differential equations with constant coefficients using Laplace transform.		
Unit 03	**FOURIER SERIES**	**12 Hours**
General Fourier series – Dirichlet's conditions – Change of intervals – Odd and even functions – Half range sine and cosine series – Root mean square – Parseval's identity – Harmonic analysis.		
Unit 04	**FOURIER TRANSFORMS**	**12 Hours**
Statement of Fourier integral theorem – Infinite Complex Fourier transform pair and their Properties – Infinite Fourier sine and cosine transforms pair and their properties –Transforms of simple functions – Parseval's identity.		
Unit 05	**PARTIAL DIFFERENTIAL EQUATIONS**	**12 Hours**
Formation of partial differential equations – Lagrange's partial differential equation – Clairaut's form of partial differential equations – Second order linear partial differential equation with constant coefficients.		

Theory: 45 Hours	Tutorial: 15 Hours	Practical: -	Project: -	Total Hours: 60 Hours

TEXT BOOKS:

1. T. Veerarajan, "Transforms and Partial Differential Equations", McGraw Hill Publishers, 3rd Edition, 2016.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCE BOOKS:

1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
2. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

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BoS Date: 08. 07. 2023	HoD / Mathematics

U23PHY203A	PHYSICS FOR BIOMEDICAL ENGINEERING	L	T	P	J	C
		3	0	2	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1:	Analyse the relation between the arrangement of atoms and material properties.
CO2:	Discuss the dual nature of matter and radiation and the application of the wave nature of particles.
CO3:	Describe the basic components of lasers.
CO4:	Explain the ultrasonic inspection technique in the field of medicine.
CO5:	Elucidate the applications of X-rays and radioactivity in the field of medicine.

Pre-requisite:

Basic knowledge of modern physics, optics, and ultrasonics.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO2	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO3	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO4	3	2	-	-	-	2	2	-	-	2	-	1	-	2
CO5	3	2	-	-	-	2	2	-	-	2	-	1	-	2

Course Assessment methods

Direct		Indirect
CIE test I (10) - Theory CIE test II (10) - Theory CIE test III (10) - Theory CIE test IV(15) - Laboratory	Assignment / Quiz / Seminar (5) Total CIE: 50 marks Semester End Examination: 50 marks SEE- Theory (35 marks), Lab (15 marks)	Course end survey

Unit 01: CRYSTAL PHYSICS — **9 Hours**

Importance of crystals - Types of crystals - Basic definitions in crystallography (Lattice -space lattice -

unit cell - lattice parameters - basis) - Seven crystal systems and fourteen Bravais lattices - Lattice planes and Miller indices - Interplanar distance - d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number and Atomic Packing Factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy - Crystal imperfections - Point, line and surface defects - Burger vector.

Unit 02: QUANTUM PHYSICS	**9 Hours**

Limitations of classical theory - Dual nature of matter and radiation. Particle nature of radiation - Compton effect - Expression for Compton shift (no derivation) - Wave nature of matter - de Broglie waves - Heisenberg's Uncertainty Principle -Schrödinger's time independent and time dependent wave equations - Physical significance of wave function - Energy and wave function of an electron trapped in one dimensional box - Application of wave nature of particles - Electron microscope - Comparison of optical and electron microscope - Scanning electron microscope - Limitations of electron microscope.

Unit 03: LASERS	**9 Hours**

Energy level - normal population - Stimulated absorption - population inversion - metastable state - spontaneous emission - stimulated emission - Basic components of a laser - Einstein's theory of spontaneous and stimulated emission of radiation - Types of lasers - Solid state laser - Nd: YAG laser - Gas laser - CO_2 laser - Semiconductor laser - Homojunction and hetero junction laser - Holography - Construction and reconstruction of hologram -Application of laser in industry - Cutting, welding and drilling – Medical applications – Lasik.

Unit 04: ULTRASONICS	**9 Hours**

Introduction - Ultrasonic waves - Properties of ultrasonic waves - Production of ultrasonic waves by magnetostriction and piezoelectric methods - Ultrasonic imaging systems – Block diagram of ultrasonic imaging system - A scan, B scan and T-M mode display - Ultrasound pictures of human body - Ultrasonic technique to measure blood flow and heartbeat - Physiological effects of ultrasound therapy - Phonocardiography.

Unit 05: MEDICAL PHYSICS	9 Hours
Electromagnetic spectrum - Introduction to X-rays – Production of X-ray images – Producing live X-ray images – Radiation given to patients – Nuclear medicine – Sources of radioactivity – Radioisotopes for nuclear medicine – Statistical aspects of radioactivity decay in radioisotopes – Nuclear imaging techniques – Basic instrumentation for nuclear imaging – Gamma-ray camera – Positron emission tomography.	

Theory: 45 Hrs	Tutorial: --	Practical: 30 Hrs	Project: --	Total Hours: 75 Hrs

TEXTBOOKS

1. M.N. Avadhanulu, P.G. Kshirsagar, "A Textbook of Engineering Physics", S. Chand & Company Ltd, New Delhi 2014.
2. D. K. Bhattacharya, Poonam Tandon "Engineering Physics" Oxford University Press 2017.

REFERENCES

1. "Engineering Physics", Sonaversity, Sona College of Technology, Salem Revised Edition 2019.
2. M. Arumugam, "Applied Physics" Anuradha agencies, Kumbakonam 2001.
3. R. Wolfson, "Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.
4. J. R. Cameron, J. G. Skofronick, Medical Physics, John Wiley and Sons.
5. William D. Callister Jr., David G. Rethwisch, "Callister's Materials Science and Engineering", 10th Edition, Global Edition 2019.

LIST OF EXPERIMENTS	30 Hours
1.	Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus.
2.	Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer.
3.	Determination of the thermal conductivity of a bad conductor using Lee's Disc apparatus.
4.	Determination of specific resistance of a given wire using Carey Foster's bridge.

5.	Determination of the wavelength of a diode laser.
6.	Determination of particle size of lycopodium powder using diode laser.
7.	Determination of acceptance angle and numerical aperture of an optical fibre using diode laser.
8.	Determination of Wavelength of Mercury spectrum using spectrometer.
9.	Determination of coefficient of viscosity of liquid by Poiseuille's method.
10.	Determination of band gap of the given semiconductor diode.

27.1.2025

Dr. C. Shanthi
HOD / Science

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.,
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005.

27.1.25

Dr. M. Renuga
BoS – Chairperson,
Science and Humanities

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

U23EGR207	ENGINEERING GRAPHICS (Common to ADS, IT, BME, CSE, ECE, and FT branches)	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Construct –Ellipse, Parabola, Hyperbola, Cycloids and Involutes.
CO2:	Draw the projection of Point, Line and Plane surfaces.
CO3:	Draw the projection of simple solids by rotating object method.
CO4:	Develop the section of simple solids and lateral surface of truncated solids.
CO5:	Draw the isometric view to orthographic projection.

Pre-requisite: Nil

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1							3		2			1	
CO2					3			2		2		2		2
CO3					3			2		2		2	1	2
CO4					3			2		2		2	1	2
CO5			2					2		2		2	1	

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

CONCEPTS AND CONVENTIONS - (Not for Examination). **9 Hours**

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

Unit 01: PLANE CURVES - (Manual drafting).

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction

of cycloid – construction of Involute of circle – Drawing of tangents and normal to the above curves.	
Unit 02: PROJECTION OF POINTS, LINES AND PLANE SURFACES (CAD software). Orthographic projection- principles-principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes -Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to one of the principal plane by rotating object method.	**9 Hours**
Unit 03: PROJECTION OF SOLIDS (CAD software). Projection of simple solids - prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.	**9 Hours**
Unit 04: PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES. (CAD software). Section of solids in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – (obtaining true shape of section is not required). Development of lateral surfaces of truncated solids – Prisms, pyramids cylinders and cones.	**9 Hours**
Unit 05: ISOMETRIC TO ORTHOGRAPHICS PROJECTION- (Manual drafting). Representation of three dimensional objects – General Principles - Need for importance of multiple views – First angle projection – layout of views – Conversion of isometric view to orthographic views. Practicing three dimensional modelling of simple objects using CAD Software **(Not for examination)**	**9 Hours**

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2.	Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3.	Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015
4.	P.Suresh., "Engineering Graphics and Drawing", Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.

REFERENCES	
1.	BasantAgarwal and Agarwal C.M.,"Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27thEdition, 2017.
3.	Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4.	Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5.	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Dr.D.SENTHIL KUMAR, M.E.,Ph.D
PROFESSOR & HEAD
DEPT. OF MECHANICAL ENGG.
SONA COLLEGE OF TECHNOLOGY
JUNCTION MAIN ROAD, SALEM-5

BME II

U23BM201	ELECTRICAL CIRCUITS AND MACHINES FOR MEDICAL DEVICES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the Basic concepts of electrical quantities and components.
CO2:	Analyze the network topologies of the circuit.
CO3:	Analyze the performance of the basic laws to calculate the voltage, current and power for circuits.
CO4:	Explain the construction details and working principles of electrical machines.
CO5:	Elucidate the principle and working of the Special Machines used in Biomedical applications.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	-	-	-	-	1	-	1	1
CO2	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1
CO3	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1
CO4	2	2	1	-	-	-	-	-	-	-	-	1	-	1	1
CO5	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: BASICS OF ELECTRICAL PERCEPTIONS — **9 Hours**

Definition of Electric Voltage, Current, Power, Power factor and energy, Ohms law, Kirchhoff's Laws and its applications-Frequency analysis: AC and DC Signals-Types of sources: single phase-three phase. Resistance-Inductance-capacitance-Series and parallel combinations.

Unit 02: CIRCUIT ANALYSIS — **9 Hours**

Review on mesh and nodal analysis – Star Delta Transformation Techniques – Phase Relationship For R, L and C – Impedance, Admittance for R, and C Elements – Concept of Duality – Dual Network – Graphs of A Network – Trees, Twig, Link and Branches. Case Study – Measurement of skin temperature using Thermistor.

Unit 03: CIRCUIT THEOREMS-DC ANALYSIS — **9 Hours**

Superposition Theorem – Thevenin's Theorem – Norton's Theorem – Reciprocity Theorem – Maximum Power Transfer Theorem – Millman's Theorem. Case Study – Bio signal Analysis.

Unit 04: ELECTRICAL MACHINES	9 Hours
DC Generator: construction of DC Machine – working principle of DC Generator – EMF equation – Types of DC Generator. DC Motor: Working principle of DC Motor – Types of DC Motor. Step-down and Step-up Transformers: Working principle of Transformer – EMF equation – Transformation ratio. Case Study – Motorized Wheelchair.	
Unit 05: SPECIAL MACHINES	**9 Hours**
Construction-Working principle -Stepper Motor, Servo Motor, Permanent Magnet Brushless D.C. Motors and drives. Case Study – Myoelectric prosthesis.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	D P Kothari and I J Nagrath, "Basic Electrical and Electronics Engineering", Mc Graw Hills (India) Private Limited, Second Edition 2020.
2.	A Sudhkar, Shammohan Palli," Circuit and Network Analysis and Synthesis",Mc-Graw Hill,2019.

REFERENCES

1.	D. Devaraj, S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson India, 2016.
2.	Abhi Chakrabarti, Sudipta Debnath, Soumitra Kumar Mandal, "Basic Electrical & Electronics Book ",Mc Graw Hill Education; Fifth Edition, 2016.
3.	Ravi R Singh ,"Networks Analysis and Synthesis",Mc-Graw Hill Education ,2019.
4.	M.L.Soni and J.C.Guptha Acourse in " Electrical Circuit Analysis",Dhanpat Rai & Co ,2015.

Course Designer(s)
Prof.T.Karthikeyan
AP / BME

Academic Coordinator
Prof.K.Manikandan
AP/BME

BOS - Chairman
BME

Dr.S.PRABAKAR, M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

U23BM202	ELECTRONIC CIRCUITS FOR MEDICAL DEVICES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the characteristics of different electronic devices such as PN and Zener diode.
CO2:	Explain the structure and working operation of Semiconductor transistors.
CO3:	Analyze the concept of transistor bias and stability factor.
CO4:	Employ the acquired knowledge in the design and analysis of rectifiers and power supply.
CO5:	Explain the characteristics of Special Devices in Biomedical Applications.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-
CO3	3	2	1	-	2	-	-	-	-	-	-	1	2	1	-
CO4	3	2	1	-	2	-	-	-	-	-	-	1	2	1	-
CO5	3	2	1	-	-	-	-	-	-	-	-	1	2	1	-

Course Assessment methods

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination: **60 marks**	Course end survey

Unit 01: SEMICONDUCTOR DIODES — **9 Hours**

Energy band theory-Conductor-Insulator-Semiconductor-Doping-formation of N-type and P-type materials-PN junction Diode – V-I Characteristics- Zener diode- VI characteristics of Zener-Avalanche break down. - Zener effect-Zener diode as voltage regulator.

Unit 02: SEMICONDUCTOR TRANSISTORS — **9 Hours**

Bipolar Junction Transistor – construction-Working principle-Regions of transistor-CB, CE, CC Configurations and Characteristics –Transistor as a switch – Applications of transistor –JFETs – Drain and Transfer characteristics - Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation .Case Study - Differential Amplifier using BJT.

Unit 03: TRANSISTOR BIAS STABILITY — **9 Hours**

BJT-Need for biasing-Stability factor-Fixed bias circuit. Load line and quiescent point. Variation of quiescent point due to hFE variation within manufacturers tolerance-Stability factors-Different types of biasing circuits-Method of stability the Q point-Advantage of self bias (Voltage divider bias) over other types of bias as a constant current circuit.

Unit 04: RECTIFIERS AND POWER SUPPLIES	9 Hours
Classification of power supplies, Rectifiers - Half-wave, full-wave and bridge rectifiers with resistive load. Analysis for V dc and ripple voltage with C, L, LC and CLC filters. Case Study – Sphygmomanometer charger circuit.	
Unit 05: SPECIAL DEVICES	**9 Hours**
Construction and Characteristics of - Tunnel Diode-Varactor diode-Photo diode- Photo transistor- SCR-TRIAC-DIAC. Case Study – Pulse oximeter.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	D P Kothari and I J Nagrath, "Basic Electrical and Electronics Engineering", Mc Graw Hills (India) Private Limited, 2020.
2.	Millman and Halkias, "Integrated Electronics", 2nd Edition, Tata Mc Graw Hill, 2017.

REFERENCES

1.	D. Devaraj, S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson India, 2017.
2.	Abhi Chakrabarti, Sudipta Debnath, Soumitra Kumar Mandal, "Basic Electrical & Electronics Book ", Mc Graw Hill Education; Fifth Edition, 2016.
3.	Ravish Singh, "Basic Electrical & Electronics Engineering", McGraw Hill Education, 2014.
4.	Y.N. Bapat, "Electronic devices and circuits, Discrete and Integrated", 3rd Edition, Tata Mc Graw Hill, 2011.

Course Designer(s)
Prof.V.Loganathan
AP / BME

Academic Coordinator
Prof.K.Manikandan
AP/BME

BOS - Chairman
BME

Dr.S.PRABAKAR, M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

U23BM203	ELECTRICAL AND ELECTRONICS FOR MEDICAL DEVICES LABORATORY	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Understand and apply circuit theorems and concepts in engineering applications.
CO2:	Analyze the Semiconductor Device Characteristics.
CO3:	Proficiency in using virtual labs to simulate and study electrical machines.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	1	-	-	-	-	-	1	2	1	-
CO2	3	3	2	1	-	1	-	-	-	-	-	1	2	1	-
CO3	3	3	2	1	3	1	-	-	-	-	-	1	2	1	-

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE: **60 marks** Semester End Examination: **40 marks**	Course end survey

LIST OF EXPERIMENTS

1	Verification on ohms law.
2	Verification on KCL, KVL.
3	Determination of Thevenin's and Norton's analysis of the circuit.
4	V-I Characteristics of given PN junction Diode.
5	V-I Characteristics of Zener Diode.
6	Design a Half-wave and Full-wave rectifiers with a simple capacitor filter.
7	Analyse the Characteristics of Photodiode.
8	Determination of Input and output characteristics of BJT in CB, CC & CE configuration.
9	Analyse the Input and Output Characteristics V-I Characteristics of FET.
10	Study and analyse the speed control of DC Motor by using a Virtual Labs simulation.
11	Study and analyse the speed control of the DC Generator by using a Virtual Labs simulation.
12	Study and analyse the clockwise and anticlockwise rotation of the Stepper motor by using a Virtual Labs simulation.
	TOTAL : 30 HOURS

Course Designer(s)
Prof.T.Karthikeyan & Prof.V.Loganathan
AP / BME

Academic Coordinator
Prof.K.Manikandan
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BOS - Chairman
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U23TAM201	தமிழரும் தொழில்நுட்பமும்	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the weaving and ceramic technology
CO2:	Explain the design and construction technology
CO3:	Analyse the manufacturing technology
CO4:	Describe the agriculture and irrigation technology
CO5:	Explain the Scientific Tamil and Tamil Computing

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: WEAVING AND CERAMIC TECHNOLOGY — **3 Hours**

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்: 3

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

Unit 02: DESIGN AND CONSTRUCTION TECHNOLOGY — **3 Hours**

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3

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

Unit 03: MANUFACTURING TECHNOLOGY — **3 Hours**

அலகு III உற்பத்தித் தொழில் நுட்பம்: 3

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

Unit 04: AGRICULTURE AND IRRIGATION TECHNOLOGY — **3 Hours**

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3

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

Unit 05: SCIENTIFIC TAMIL & TAMIL COMPUTING — **3 Hours**

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3

அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS	
1.	தமிழக வரலாறு –மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் –முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). கீழடி –வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு) பொருநை –ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
REFERENCES	
3.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
4.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
5.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
6.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
7.	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)
8.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
9.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Journey of Civilization Indus to Vaigai (R.Ramakrishna) (Published by: RMRL) – Reference Book.

HOD

Dr. M.RENUGA,
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SALEM - 636 005.

U23GE201	BASIC APTITUDE-II (Common to All Departments)	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Solve the problems in Percentage, Conversion of Percentage to Ratio and Ratio into Percentage and work on verbal aptitude questions
CO2:	Elucidate the problems in Profit and loss and percentage of profit and loss. Choose appropriate sentence fillers and Idioms and phrase
CO3:	Crack the problems involving Geometry, Area, Perimeter/Circumference, Surface area and Volume. Comprehend the given passages for Reading Comprehension activity and answer the questions correctly.
CO4:	Deduce the problems involving Trigonometry and exhibit good expertise in detecting errors in the given sentences.
CO5:	Interpret the problems on Ages & logarithm and work on logical reasoning and demonstrate good vocabulary skill by spotting errors.

Pre-requisite:

- Basic English language and Grammar knowledge
- Knowledge in Basic Mathematics

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO 11	PO12
CO1	3	3	3	2	1	1	1	3	3	3	2	3
CO2	3	3	3	2	1	1	1	3	3	3	2	3
CO3	3	3	3	2	1	1	1	3	3	3	2	3
CO4	3	3	3	2	1	1	1	3	3	3	2	3
CO5	3	3	3	2	1	1	1	3	3	3	2	3

Course Assessment methods

Direct		Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40) – Theory	Total CIE: 100 marks Semester End Examination – NIL	Course end survey

Unit 01	6 Hours
Percentage: Conversion of a Percentage into a Fraction – Conversion of a Percentage into a Ratio – Conversion of a Ratio into a Percentage - Percentage Change – Successive percentage – Problems **Verbal Aptitude:** Jumbled sentences & Reconstructions of sentences (PQRS)	
Unit 02	**6 Hours**
Profit Loss: Types of prices – Profit – Loss – Percentage of Profit and Loss - Common Gain or Loss – Selling Price and Cost Price Equality – Successive Profit and Loss – Problems **Verbal Aptitude:** Sentence fillers two words & Idioms and phrase	
Unit 03	**6 Hours**
Geometry: Angles – Complementary and Supplementary angles – Lines – Triangle – Types of triangles – Properties of Triangles – Problems **Area, Perimeter / Circumference:** Triangles - Rectangles and Squares – Parallelogram, Rhombus and Trapezium – Circles – Problems **Surface area, curved surface area & Volume:** Cuboid – Cube – Right circular cylinder – Right circular cone – Sphere – Hemisphere– Problems **Verbal Aptitude:** Reading comprehension.	
Unit 04	**6 Hours**
Trigonometry: Value of Trigonometry ratios for particular values – Sign of Trigonometrical ratios – Trigonometrical ratios for sum or difference of angles Problems **Verbal Aptitude:** Spotting errors	
Unit 05	**6 Hours**
Averages – Problems on ages – Logarithm **- Logical Reasoning:** Alpha Series – Venn diagram – Problems **Verbal Aptitude**: Writing captions for given pictures.	

Theory: 30 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 30 Hrs

TEXT BOOKS

1.	S.Chand and Dr.R.S.Aggarwal, "Quantitative Aptitude for competitive examinations", S Chand and Company Limited 2019.
2.	Nishit K.Sinha, "Logical Reasoning and Data Interpretation", Pearson 2021.

6/02/2024

Dr.S.Anita
Professor & Head
Department of Training

Dr. S. ANITA
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SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

U23TAM201	TAMILS AND TECHNOLOGY	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the weaving and ceramic technology
CO2:	Explain the design and construction technology
CO3:	Analyse the manufacturing technology
CO4:	Describe the agriculture and irrigation technology
CO5:	Explain the Scientific Tamil and Tamil Computing

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: WEAVING AND CERAMIC TECHNOLOGY — **3 Hours**

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

Unit 02: DESIGN AND CONSTRUCTION TECHNOLOGY — **3 Hours**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Unit 03: MANUFACTURING TECHNOLOGY — **3 Hours**

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

Unit 04: AGRICULTURE AND IRRIGATION TECHNOLOGY — **3 Hours**

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

Unit 05: SCIENTIFIC TAMIL & TAMIL COMPUTING — **3 Hours**

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

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1. தமிழக வரலாறு –மக்களும் பண்பாடும் –
கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் –முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
கீழடி –வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
பொருநை –ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

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

HOD

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U23OL1201	French - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Accept and refuse of an invitation, give some instruction of do's and don'ts, converse in commercial centres, write an invitation
CO2:	Describe a city, locate a place in a city, ask further details, describe one's hometown
CO3:	Talk about things around us, recite a past event, identify sign boards, express agree and disagree, express obligation and prohibition, sell an object in online
CO4:	Talk about one's goals, express one's feelings, write a list of things to do, express an opinion, talk about weather, draft a mail response
CO5:	Express one's interest and wish, describe a pet animal, express one's aversions, encourage others, write to ask for a help, narrate a past event, write a biography

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 2: City shopping and services, conjugation: payer, manger and acheter, negative sentence Hr 4: Imperative sentence, food and beverages, utensils, cutleries, corckeries Hr 6: Quantitative articles, quantities, pronoun 'en', express appreciation, write an invitation	
Unit 02:	**3 Hours**
Hr 8: City and localities, Conjugation: prendre, adjectives of place, pronoun 'y' Hr 10: Transport, leisure activities, preposition of place, degrees of comparison Hr 12: Asking information about a new place, describe a city	
Unit 03:	**3 Hours**
Hr 14: Things in a store, conjugation : faire, imparfait 2, passé composé Hr 16: Things in a repairing shop, computer, relative pronouns: que and qui Hr 18: Imperative negative, express obligation and interdiction, online sale and response	
Unit 04:	**3 Hours**
Hr 20: Professions, conjugation: croire, voir, recent past tense Hr 22: Traveling formalities, expressing about health condition, future tense Hr 24: Pronoun COD, talk about weather condition, write about one's plans and projections	
Unit 05:	**3 Hours**
Hr 26: Citizenship and solidarity, conjugation: connaitre and savoir, depuis vs pendant Hr 28: Imparfait vs passé composé, nature and environment, indirect pronouns COI Hr 30: Animals, conditional, talk on supporting others, write a biography	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide relevant audios, videos, handouts and notes.
2.	Books : Saison (Méthode de français, cachier d'activités)
3.	Reference books : La conjugaison, Dondon, Echo

13/2/24.

HOD

Dr. M.RENUGA,
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Sona College of Technology,
SALEM - 6.

U23OL1202	German - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use grammatical expressions appropriately in day-to-day conversation.
CO2:	Make them frame simple sentences /questions.
CO3:	Accentuate to start and sustain basic conversation
CO4:	Helps them articulate thoughts in German
CO5:	Identify the different forms of the verb

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Nominative/accusative case, adjectives	
Unit 02:	**3 Hours**
Modes of transportation, orientation, giving/understanding simple directions	
Unit 03:	**3 Hours**
• Food and beverages, Modal verbs, Separable verbs	
Unit 04:	**3 Hours**
• Simple sentences using modal / separable verbs	
Unit 05:	**3 Hours**
• Articles of clothing	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1. Netzwerk A1

HOD 13/2/24

Dr. M.RENUGA,
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Sona College of Technology,
SALEM - 636 :

U23OL1203	Japanese - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Use verbs in polite conversation or for dissuasion and describe two different activities
CO2:	Demonstrate the application of causative verbs and those that express ability or possibility, and describe experiences
CO3:	Use plain-style expressions, those that state opinions, and verbs and adjectives that go with nouns
CO4:	Express sentences that use 'when' and 'if' and those that describe how services are given and received
CO5:	Read 126 letters of Kanji, and demonstrate adequate knowledge of the lessons learnt in Levels I and II to pass the Japanese Language Proficiency Test (JLPT) for the N5 Level

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01:	**3 Hours**
Hr 1-2: Words and verbs expressing requests / Kanji 1-10 Hr 3-4: Asking for permission; making statements to prohibit something / Kanji 11-20 Hr 5-6: Describing two activities / Kanji 21-30	
Unit 02:	**3 Hours**
Hr 7-8: Verbs that express 'I have to ...' / Kanji 31-40 Hr 9-10: Verbs which express ability or possibility / Kanji 41-50 Hr 11-12: Describing experience / Kanji 51-60	
Unit 03:	**3 Hours**
Hr 13-14: Plain-style expressions / Kanji 61-70 Hr 15-16: Expressions like 'I think that ...' / Kanji 71-80 Hr 17-18: Qualifying nouns with verbs and adjectives / Kanji 81-90	
Unit 04:	**3 Hours**
Hr 19-20: Expressions using 'When ...' / Kanji 91-100 Hr 21-22: Describing the giving and receiving of services / Kanji 101-110 Hr 23-24: Expressions using 'If ...' / Kanji 111-126	
Unit 05:	**3 Hours**
Hr 25-26: Preparing for JLPT N5 Hr 27-28: Preparing for JLPT N5 Hr 29-30: Preparing for JLPT N5	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

TEXT BOOKS

1.	The course faculty will provide handouts / notes / course material.
2.	Books on Basic Japanese language available in the college library.

13/4/24

HOD

Dr. M.RENUGA,
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SALEM - 636 005.

U23OL1204	Korean - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Identify time
CO2:	Identify the date and days of the week
CO3:	Explain location and places
CO4:	Explain destination
CO5:	Construct simple sentences / questions.

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: Time	3 Hours
Talking about time	
Unit 02: Date	3 Hours
Talking about dates and days of the week Talking about doing something in the past	
Unit 03: Location	**3 Hours**
Talking about location Talking about doing something at a location	
Unit 04: Direction	**3 Hours**
Talking about directions	
Unit 05: Future	**3 Hours**
Talking about doing something in the future Talking about plans for the future Talking about hope for the future	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	Vitamin Korean - 1

13/2/24.

HOD

Dr. M.RENUGA,
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Department of Humanities & Languages,
Sona College of Technology,
SALEM - 636 005.

U23OL1205	Hindi - II	L	T	P	J	C
		1	0	0	0	1

Course Outcomes

At the end of the course, the students will be able to

CO1:	Write Tenses and Self – Introduction
CO2:	Write Hindi numbers & sentence Translations
CO3:	Read and Write comprehension question & days of the week
CO4:	Read and frame sentences (Story) & part of the body
CO5:	Communicate effectively using tenses (Conversation)

Course Assessment methods

Direct		Indirect
CIE test I (30) CIE test II (30) CIE test III (40)	Total CIE: 100 marks Semester End Examination: NIL	Course end survey

Unit 01: Tenses and Self – Introduction	3 Hours
Learning Hindi pronunciation Speaking based on Tenses (Present, past & future) Reading Writing	
Unit 02: Hindi Numbers & Sentence Translations	3 Hours
Reading Writing Letters pronunciation Meanings learning	
Unit 03: Comprehension question & Days of the week	**3 Hours**
Reading & analysing the meaning Learning	
Unit 04 : Story and Part of the body	**3 Hours**
Words meaning Reading & Writing Sentence framing	
Unit 05 : Conversation and Colours name	**3 Hours**
Conversation between a boy and Doctor Coersation between Taxi driver and Passenger	

Theory: 15 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 15 Hrs

REFERENCES

1	Diploma in Hindi (department of higher education, Delhi)
2	Hindi Prachara sabha exam books (Prathamic and Madhyama)

HOD

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BME III

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	U23MAT301D	Probability and Statistics	3	1	0	0	4	BS	60	TT
2.	U23BM301	Transducers and Biosensors	3	0	0	0	3	PC	45	T
3.	U23BM302	Signals and Systems for Biomedical Applications	2	1	0	0	3	PC	45	TT
4.	U23BM303	Radiation Physics and Biophotonics	3	0	0	0	3	PC	45	T
5.	U23BM304	Anatomy and Human Physiology	3	0	0	0	3	PC	45	T
6.	U23BM305	Biomaterials	3	0	0	0	3	PC	45	T
7.	**noc25-mg106**	NPTEL Design Thinking - A Primer	1	0	0	0	1	ES	15	T
8.	U23GE302	**Audit Course**: Environment and Climate Science	2	0	0	0	0	AC	30	T
Practical courses										
9.	U23BM306	Anatomy and Human Physiology Laboratory	0	0	2	0	1	PC	30	L
10.	U23BM307	Transducers and Biosensors Laboratory	0	0	2	2	2	PC	60	LP
11.	U23GE301	Soft Skills and Aptitude-I	0	0	2	0	1	EEC	30	L
							Total Credits	24		

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project.

Approved By

Chairperson, Biomedical Engineering BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr.S.Prabakar	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Biomedical Engineering, Third Semester B.E. BME Students and Staff, COE

SEMESTER - III	PROBABILITY AND STATISTICS (CSE / BME / MECH/ EXE)	L	T	P	J	C
U23MAT301D		3	1	0	0	4

COURSE OUTCOMES

At the end of the course, the student will be able to

CO1:	apply the concepts of measures of central tendency, dispersion to the given data and analyze the results.
CO2:	compute simple and partial correlation coefficients and analyze regression equations for estimation and prediction purposes.
CO3:	apply the concepts of random variables and their properties to generate the moments.
CO4:	fit the suitable distribution and its properties to the real world problems and interpret the results.
CO5:	apply the concepts of joint probability distribution and its properties to find the covariance.

Pre-requisites:

- Fundamentals of elementary algebra
- Fundamentals of calculus
- Fundamentals of trigonometry
- Fundamentals of geometry

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3 (CSE)
CO1	3	3	3	3	3						2	2	2		2
CO2	3	3	3	3	3						2	2	2		2
CO3	3	3	3	3	3						2	2	2		2
CO4	3	3	3	3	3						2	2	2		2
CO5	3	3	3	3	3						2	2	2		2

COURSE ASSESSMENT METHODS

DIRECT		INDIRECT
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/Quiz/Seminar (5) Total CIE: 40 marks Semester End Examination: 60marks	Course end survey

Unit 01	MEASURES OF CENTRAL TENDENCY AND DISPERSION	12 Hours

Measures of central tendency (simple arithmetic mean, median, mode) – Quartiles – Measures of dispersion - Absolute and relative measures (range, inter-quartile range, quartile deviation, mean deviation about mean, standard deviation, coefficient of variation) .

Unit 02	CORRELATION AND REGRESSION	12 Hours

Simple and rank correlations – Multiple and partial correlations – Linear regression – Relation between simple correlation and regression - Curve fitting (straight line and parabola).

Unit 03	ONE DIMENSIONAL RANDOM VARIABLE	12 Hours

One dimensional random variable – Discrete random variable – Distribution function of the discrete random variable –Probability mass function– Properties– Continuous random variable– Distribution function of the continuous random variable – Probability density function –Properties –Moments – Mathematical expectations– Moment generating function and its properties.

Unit 04	THEORETICAL DISTRIBUTIONS	12 Hours
Discrete distributions- Binomial distributions- Additive property, moment generating function, mean, variance and standard deviation of binomial distribution- Poisson distribution - Additive property, moment generating function, mean, variance and standard deviation of Poisson distribution - Poisson distribution as limiting form of binomial distribution (Statement only)- Geometric distribution- Memoryless property, moment generating function, mean, variance and standard deviation of Geometric distribution- Continuous distribution- Uniform distribution- moment generating function, mean, variance and standard deviation of Uniform distribution- Exponential distribution- Memoryless property, moment generating function, mean, variance and standard deviation of exponential distribution- Normal distribution- Additive property, moment generating function, mean, variance and standard deviation of Normal distribution (without derivation)- Normal distribution as limiting form of binomial distribution (Statement only)-Problems based on real time applications in discrete and continuous distributions.		
Unit 05	**TWO DIMENSIONAL RANDOM VARIABLES**	**12 Hours**
Two dimensional discrete random variables – Joint probability distributions of discrete random variables- Marginal and conditional probability distributions- Two dimensional continuous random variables- Joint probability density function- Joint probability distribution function for continuous two dimensional random variables- Marginal and conditional density functions- Covariance- Correlation.		

Theory: **45 Hours**	Tutorial: **15 Hours**	Practical:--	Project:--	Total: **60 Hours**

TEXT BOOKS:

1.	S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Revised Edition, 2019.
2.	T. Veerarajan, "Probability, Statistics and Random Processes with Queuing Theory and Queuing Networks", McGraw Hill Publishers, 4th Edition, 7th Reprint, 2018.

REFERENCE BOOKS:

1.	R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
2.	S. Ross, "A First Course in Probability", Pearson Publishers, 9th Edition, 2019.
3.	S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 46th Edition, 2023.

B.E/B. TECH REGULATIONS 2023	HEAD OF THE DEPARTMENT OF MATHEMATICS
S&H BoS DATE:22-06-2024	

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U23BM301	TRANSDUCERS AND BIOSENSORS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to		K - Levels
CO1:	Understand the purpose and methods of measurements.	K2
CO2:	Classify the Biomedical Sensors and Transducers.	K2
CO3:	Interpret about the Photoelectric and Piezoelectric Transducers	K3
CO4:	Describe the principle and components of Biosensors.	K2
CO5:	Explain the principles of Biochemical sensors.	K3

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	1	-	1	1	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	1	-
CO4	3	-	1	-	-	-	-	-	-	1	-	1	1	-	-
CO5	3	1	1	-	1	1	-	-	1	-	-	1	1	1	1

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: SCIENCE OF MEASUREMENT — **9 Hours**

Measurement System–Instrumentation–Classification and Characteristics of Transducers– Static and Dynamic–Errors in Measurements– Calibration–Primary and secondary standards

Unit 02: DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS — **9 Hours**

Strain Gauge: Gauge factor, Types of strain gauges - Biomedical applications, strain gauge as displacement & pressure transducers. Active type: Thermocouple–biomedical applications. LVDT, Capacitive transducer, Inductive transducer. Passive types: Thermo Resistive- Resistance Temperature Detectors (RTD), Thermistor, biomedical applications.

Unit 03: PHOTOELECTRIC AND PIEZOELECTRIC TRANSDUCERS — **9 Hours**

Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photoconductive cells, photo diodes, phototransistor, Spectrophotometry. Piezoelectric transducers- modes of operation of piezoelectric crystals- uses of piezoelectric materials and transducers, biomedical applications as ultrasound transducers.				
Unit 04: INTRODUCTION TO BIOSENSORS				**9 Hours**
Basic principle and Components of a biosensor, Molecular recognition, Classification of biosensors based on transducers, Piezoelectric biosensors, Magneto elastic biosensors, Field effect transistor-based biosensor, Calorimetric biosensor, Non-invasive biosensors				
Unit 05: APPLICATIONS OF BIOSENSORS IN HEALTH AND ENVIRONMENT				**9 Hours**
Biosensors and diabetes management, Microfabricated biosensors and point-of-care diagnostics systems, Noninvasive biosensors in clinical analysis; Surface plasmon resonance and evanescent wave biosensors, Biosensor in cancer diagnosis.				
Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	A.K.Sawhney,"Electrical & Electronics Measurement and Instrumentation",10th edition, Dhanpat Rai & Co,NewDelhi,2010.
2.	Pierre R. C, and Loïc J.B,Biosensor Principles and Applications, , CRC Press, 2019
3.	Jeong-Yeol Yoon,Introduction to Biosensors, Springer-Verlag New York Ed. 2016

REFERENCES

1.	Ernest O Doebelin and Dhanesh N Manik, Measurement systems, Application and design, 5th edition, Mc Graw-Hill,2007.
2.	Keith Brindley, Sensors & Transducers, Heinemann Newnes, Great Britain, 1988 Harry Thomas , Handbook of Bio medical Instrumentation, Reston, Virginia 2000
3.	Xueji Zhan , Electrochemical Sensors, Biosensors and their Biomedical Applications 1st Edition
4.	M.L.Soni and J.C.Guptha Acourse in " Electrical Circuit Analysis",Dhanpat Rai & Co ,2015.
5.	L.A Geddas and L.E.Baker, "Principles of Applied Biomedical Instrumentation", John Wiley and Sons, Third Edition, Reprint 2008.
6.	Albert D. Helfrick and William D.Cooper. "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.
7.	Principles of Applied Biomedical Instrumentation L.A Geddas and L.E.Baker – John Wiley and sons.
8.	Chandran Karunakaran Kalpana Bhargava Robson Benjamin,Biosensors and Bioelectronics, 1st Edition, Hardcover ISBN: 9780128031001, Imprint: Elsevier , Published Date: 29th July 2015.

Course Designer(s)
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U23BM302	SIGNALS AND SYSTEMS FOR BIOMEDICAL APPLICATIONS	L	T	P	J	C
		2	1	0	0	3

Course Outcomes

At the end of the course, the student will be able to		K - Levels
CO1:	Classify the signals as continuous time and discrete time signals and classify systems based on their properties	K1
CO2:	Determine the response of LTI system using convolution sum for DT system and Convolution Integral for CT system.	K2
CO3:	Apply Fourier series and Fourier Transform for periodic Signals	K3
CO4:	Analyze system using Laplace transform and realize the structure for CT system.	K4
CO5:	Analyze system using Z transform and realize the structure for DT system	K4

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	-	-	-	-	-	-	1	3	3	-
CO2	3	2	2	1	-	-	-	-	-	-	-	1	3	3	-
CO3	3	3	1	1	2	-	-	-	-	-	1	-	3	3	-
CO4	3	3	2	2	-	-	-	-	-	-	1	-	3	3	-
CO5	3	3	2	2	2	-	-	-	-	-	1	-	3	3	-

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: CLASSIFICATION OF SIGNALS AND SYSTEMS — **9 Hours**

Continuous-Time and Discrete-Time signals–The Unit Impulse Unit Step, Unit Ramp Signals and other Basic Signals Operation of Signals -Time Shifting – Time Reversal – Amplitude Scaling – Time Scaling – Signal Addition – Multiplications – Apply operations of signals in ECG. Classification of Continuous Time Signals- Discrete Time Signal - Continuous Time System- Discrete Time System

Unit 02: LINEAR TIME-INVARIANT SYSTEMS — **9 Hours**

Continuous-Time LTI Systems: The Convolution Integral - Graphical and Analytical approach – Properties of Linear Time-Invariant Systems – Solution of Differential Equations.
Discrete-Time LTI system: The Convolution sum-tabulation method-matrix multiplication method- graphical and analytical approach – Solution of Difference Equations.

Unit 03: ANALYSIS OF CT SIGNALS USING FOURIER SERIES & FOURIER TRANSFORM — **9 Hours**

Fourier Series Representation (Trigonometric and Exponential) of Continuous-Time PeriodicSignals – Properties of Continuous-Time Fourier Series – Representation of Aperiodic Signals: The Continuous- Time Fourier Transform – The Fourier Transform for Periodic Signals – Properties ofthe Continuous-Time Fourier Transform. Applications of Fourier Analysis in Bio signals – Introduction to Rajan Transform.	
Unit 04: ANALYSIS OF SIGNALS AND SYSTEMS USING LAPLACE TRANSFORM	**9 Hours**
The Laplace Transform – The Region of Convergence for Laplace Transform– The Inverse LaplaceTransform using Partial fraction– Properties of the Laplace Transform–System Function and Block Diagram Representations-Direct Form I and Direct Form II. Applications of Laplace Transform in Bio signals.	
Unit 05: ANALYSIS OF SIGNALS AND SYSTEMS USING Z-TRANSFORM	**9 Hours**
The Z-Transform – The Region of Convergence for the Z-Transform –The Inverse Z-Transform using Partial fraction and Long division method– Properties of the Z-Transform – System Function and Block Diagram Representations-Direct Form I and Direct Form II.	

Theory: 30 Hrs	Tutorial: 15	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, "Signals and Systems", 2nd E, Prentice Hall India, 2022
2.	A. NagoorKani, "Signals & Systems", Tata McGraw Hill, 2016

REFERENCES

1.	M .J. Roberts, "Signals & Systems Analysis using Transform Methods & MATLAB", Tata McGraw Hill, 2007
2.	Haykin, Simon, and Barry Van Veen. "Signals and systems", John Wiley & Sons, 2007.
3.	A.Anand Kumar, "Signals and Systems", 3rd Edition, Prentice Hall India,2013
4.	John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, andApplications", 4th E, PHI, 2007
5.	Robert A. Gable, Richard A. Roberts, "Signals & Linear Systems", 3rd E, John Wiley, 1995
6.	Edward W Kamen& Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007

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U23BM303	RADIATION PHYSICS AND BIOPHOTONICS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to		K-Levels
CO1:	Illustrate the basic physics of light, sound with its intensity.	K2
CO2:	Comprehend the characteristics, differences between various types of radioactive decay methods.	K2
CO3:	Describe the concepts of radiation interaction with matter.	K3
CO4:	Explain the clinical significance of light and laser interactions with tissues.	K3
CO5:	Discuss the working principles of different photonic detectors.	K3

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	-

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: FUNDAMENTALS OF LIGHT & SOUND WAVES — **9 Hours**

Introduction to Electromagnetic spectrum, Light : Physics of light- Intensity of light- limits of Vision and color vision, Sound: Physics of sound- Normal sound levels, Ultrasound fundamentals-Ultrasound Transducer- Overview of non – ionizing radiation effects: Low Frequency effect, High frequency effect- Thermography – Application.

Unit 02: PRINCIPLES OF RADIOACTIVE NUCLIDES — **9 Hours**

Radioactive Decay, Spontaneous Emission, Isomeric Transition, Gamma ray emission- alpha- beta- Positron decay- electron capture, Sources of Radioisotopes: Natural and Artificial radioactivity, Production of radionuclides: fission- neutron activation- cyclotron -generator, Radionuclide in Medicine

Unit 03: INTERACTION OF RADIATION WITH MATTER — **9 Hours**

Interaction of charged particles with matter: Specific ionization- Linear energy transfer range- Bremsstrahlung- Annihilation, Interaction of X and Gamma radiation with matter: Photoelectric effect- Compton Scattering - Pair production, Attenuation of Gamma Radiation, Interaction of neutron with matter and their clinical significance.	
Unit 04: OPTICAL PROPERTIES OF THE TISSUE	**9 Hours**
Refraction, Scattering, Absorption, Light transport inside the tissue, Tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles - Laser Characteristics as applied to medicine and Biology-Laser Tissue Interaction-Chemical Thermal-Electromechanical – Photo ablative processes.	
Unit 05: INSTRUMENTATION IN PHOTONICS	**9 Hours**
Instrumentation for absorption, Scattering and emission measurements, excitation light sources – high pressure arc lamp, LEDs, Lasers, Optical filters, - optical detectors – Time resolved and phase resolved detectors.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. B.H. Brown, R.H. Smallwood, D.C. Barber, P.V. Lawford, D.R. Hose, "Medical Physics and Biomedical Engineering", Institute of physics publishing, Bristol and Philadelphia, 2017.
2. Paras N. Prasad, "Introduction to Biophotonics", A. John Wiley and Sons, Inc. Publications, 2016

REFERENCES

1. W.J. Meredith and J.B. Massey, "Fundamental Physics of Radiology" Varghese Publishing house, 3rd Edition 2013.
2. Gopal B. Saha, "Physics and Radiobiology of Nuclear Medicine", Springer, 2013.
3. Ervin B Podgorsak, "Radiation Physics for Medical Physicists: Biological and Medical Physics, Biomedical Engineering", Springer, Heidelberg, 2016
4. Markolf H.Niemz, "Laser-Tissue Interaction Fundamentals and Applications", Springer, 2007.
5. Brian Culshaw, "Introducing Photonics", Cambridge University Press, 30 July 2020
6. https://onlinecourses.nptel.ac.in/noc21_ge13/preview

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U23BM304	ANATOMY AND HUMAN PHYSIOLOGY	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to		K - Levels
CO1:	Understand the structural and functional organization of human body	K2
CO2:	Describe the physiological processes and regulatory mechanisms of the respiratory and urinary systems	K3
CO3:	Analyze the components and functions of the blood and cardiovascular system.	K3
CO4:	Illustrate the structure and function of the skeletal and special sensory systems, including bone types, joint types, cartilage, vision, and hearing mechanisms.	K2
CO5:	Explain about the physiology of the central and Autonomic Nervous System.	K3

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	2	1	-	-	1	-	-	-	-	-	-	1	1	-	-
CO3	2	1	-	-	1	-	-	-	-	-	-	1	1	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: FUNDAMENTALS OF HUMAN PHYSIOLOGY	9 Hours

Structure of Cell – levels of structural organization - Polarization and Depolarization of Cell, Tissue: Types – Homeostasis – Positive and Negative Feedback Mechanism - Muscle Physiology.
General principles of Gastrointestinal function, Secretory functions of the alimentary tract, Digestion and Absorption in the Gastrointestinal Tract.

Unit 02: RESPIRATORY SYSTEM AND URINARY SYSTEM	9 Hours

Respiratory System: Physiological aspects of respiratory system – Trachea and Lungs - Exchange of gases - Respiratory Mechanism. Types of respiration - Oxygen and Carbon Dioxide transport and acid base regulation.

Urinary System: Structure of Kidney and Nephron - Mechanism of Urine formation - blood pressure regulation by urinary system.

Unit 03: BLOOD AND CARDIOVASCULAR SYSTEM	**9 Hours**

Blood - Composition - Functions of blood – Functions of RBC - WBC types and their functions Blood groups – Importance of blood groups – Identification of blood groups. Blood vessels and its Types – blood clotting - Wound healing.

Anatomy of heart – Properties of Cardiac muscle – Conducting system of heart – Cardiac cycle - Volume and Pressure changes and regulation of Heart Rate – Heart Sound – Coronary Circulation.

Unit 04: SKELETAL AND SPECIAL SENSORY SYSTEM	**9 Hours**

Skeletal system - Bone types and functions – Axial Skeleton and Appendicular Skeleton. Joint - Types of Joint – Cartilage structure, types and functions.

Special Sensory system - Optics of vision – receptor and neural function of the retina – photochemistry of vision – central neurophysiology of vision – Physiology of hearing mechanism – hearing loss – Audiograms – Hearing tests – Taste and Smell sensors

Unit 05: NERVOUS SYSTEM	**9 Hours**

Central Nervous System - Structure of a Neuron – Neuroglial Cells - Synapses – Nerve conduction and Action potentials - Brain - Divisions of brain lobes - Cross Sectional Anatomy of Brain - Cortical localizations and functions. Spinal cord – Tracts of spinal cord – Spinal Nerve - Reflex mechanism – Types of reflex.

Autonomic Nervous system - Functions – Reflex actions of sympathetic and parasympathetic nervous system.

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1. Arthur C. Guyton, "Text book of Medical Physiology", Elsevier Saunders, 14th Edition, 2020.
2. Elaine.N. Marieb, "Essential of Human Anatomy and Physiology", Pearson Education New Delhi, 13th Edition, April 2021.
3. Ross and Wilson "Anatomy and Physiology in Health and Illness", Anne Waugh, 14th Edition, October 2022.

REFERENCES

1. William F. Ganong,"Review of Medical Physiology", Mc Graw Hill, New Delhi, 25th Edition, 2015.
2. Eldra Pearl Solomon. "Introduction to Human Anatomy and Physiology", 3rd edition, W.B.Saunders Company, 2008.

Course Designer(s)	Academic Coordinator	BOS - Chairman
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U23BM305	BIOMATERIALS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to		K – Levels
CO1:	Describe the basic properties of Biomaterials.	K2
CO2:	Explain the types of Metallic & Ceramic biomaterials with applications.	K3
CO3:	Summarize about polymeric and composite biomaterials.	K3
CO4:	Outline the host responses of biomaterials to human body.	K2
CO5:	Explain the various bio implants and surgical aids.	K2

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	1	-	-	-	1	-	2	-	1	-
CO2	2	2	1	-	-	1	-	-	-	1	-	2	-	1	-
CO3	2	2	1	-	-	1	-	-	-	1	-	2	-	1	-
CO4	2	2	1	-	-	1	-	-	-	1	-	2	-	1	-
CO5	2	2	1	-	-	1	-	-	-	1	-	2	-	1	-

Direct		Indirect
CIE test I (9) CIE test II (9) CIE test III (10) Objectives Test (7)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: INTRODUCTION TO BIOMATERIALS — **9 Hours**

Biomaterial, Types of Biomaterials, Biocompatibility, Biodegradable material, Bioresorbable material, Bio-inert material, Bio-active material, Minimum Requirements of Biomaterials, Surface Properties of Biomaterials, Desirable Properties of Biomaterial, Performance of Biomaterials, Applications of Biomaterials with examples.

Unit 02: METALLIC & CERAMIC BIOMATERIALS — **9 Hours**

Metallic Biomaterials: Introduction, Stainless steel, Co-Cr Alloys, Ti-Alloys, Nitinol, Dental metals, Corrosion of Metallic implants, Manufacturing of Metallic implants, Applications.

Ceramic Biomaterials: Introduction, Types of Ceramics, Bio-inert ceramics: Alumina, Zirconia, Carbon, Bioresorbable ceramics: Calcium Phosphate, Bioactive ceramics: Glass ceramics, Applications.

Unit 03: POLYMERIC & COMPOSITE BIOMATERIALS	9 Hours
Polymeric Biomaterials: Introduction, Basic structures of Polymers, Polymerization and its Types, Polyethylene, Polypropylene, Polyamides, Polyacrylates, Hydrogel, Bone cement, Fluorocarbon polymers, Silicon Rubber, Bioactive Polymers, Biodegradable Polymers, Applications. **Composite Biomaterials:** Introduction, Dental filling Composites & cement, Porous Composites, Fibrous & Particulate composites.	
Unit 04: BIOCOMPATIBILITY TESTING & RESPONSE OF BIOMATERIAL TO HUMAN BODY	**9 Hours**
Biocompatibility Testing: Introduction, In-Vitro Testing, In-Vivo Testing, Hypersensitivity, Haemocompatibility,Odontocompatibility,Osteocompatibility, Cytotoxicity, Genotoxicity, Carcinogenicity. **Response of Biomaterial to Human Body:** Blood-Biomaterial Interactions, Biomaterials-Tissue Interactions, Tissue response to Implants, Inflammation, Wound Healing, Foreign Body Response, Infection and Tumorigenesis of Biomaterials	
Unit 05: BIO-IMPLANTS & SURGICAL AIDS	**9 Hours**
Stent, Vascular grafts, Artificial Heart valves, Inferior Vanacava filter, Contact lenses, Intra-ocular lenses, Artificial Silicon Retina, Temporary fixation Devices, Total Hip Replacement, Total Knee Replacement, Dental filling & Restoration material, Dental implants, Suture materials, Wound dressings, Tissue Adhesives.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:-	Total Hours: 45 Hrs

TEXT BOOKS

1.	Biomaterials- Basic Theory with Engineering Applications C.Mauli Agarwal, Joo L.Ong, Mark R. Appleford, Gopinath Mani. Cambrige University Press, New York- 2016.
2.	Biomaterials: An introduction, By Joon B. Park, Roderic S. Lakes, Springer, 2007

REFERENCES

1.	Biomaterials Science: An Introduction to Materials in Medicine- By Buddy D. Ratner, et. al. Academic Press, San Diego, 2015.
2.	Sujata V. Bhat, Biomaterials, Narosa Publishing House, 2014.

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U23BM306	ANATOMY AND HUMAN PHYSIOLOGY LABORATORY	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to		K-Levels
CO1:	Evaluate and interpret the results of blood cell counts to diagnose and understand physiological and pathological conditions.	K4
CO2:	Apply analytical techniques to prepare and analyze blood components and measure biochemical parameters, such as glucose, creatinine, urea, and cholesterol.	K3
CO3:	Analyze pH levels, assess color vision, and determine the concentration of solutions.	K4

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	1	-	1	1	1	-	1	1	1	-	1
CO2	2	1	-	-	1	-	-	-	1	-	1	1	1	-	-
CO3	2	1	-	-	1	-	-	-	1	-	1	1	1	-	-

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE : **60 marks** Semester End Examination : **40 marks**	Course end survey

LIST OF EXPERIMENTS

1	Preparation of serum and plasma from blood using centrifuge.
2	Blood group identification.
3	Total count of RBCs and Estimation of haemoglobin, ESR, PCV, MCH, MCV and MCHC.
4	Differential count of different WBCs.
5	Determination of bleeding and clotting time.
6	Measure the amount of blood using blood glucose estimation.
7	Measure the level of creatinine in the blood to check kidney function.
8	Determination of urea in blood by Urease method.
9	Estimation of cholesterol in serum.
10	Measurement of pH of solutions using pH meter.
11	Ishihara chart for color blindness and Snellen's chart for myopia and hyperopia - by letters reading and Ophthalmoscope to view retina.
	TOTAL : 30 HOURS

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U23BM307	TRANSDUCERS AND BIOSENSORS LABORATORY	L	T	P	J	C
		0	0	2	2	2

Course Outcomes

At the end of the course, the student will be able to		K - Levels
CO1:	Evaluate the performance of temperature, pressure, displacement & torque - measurement using relevant sensors/transducers	K3
CO2:	Demonstrate the characteristics of an Biosensors and transducers (LDR, Load cell & pH Bio-electrodes)	K3
CO3:	Design the biosensor based circuit and measuring biological parameters.	K4

**K1-Remebering, K2-Understanding, K3-Applying, K4- Analyzing, K5-Evaluating, K6- Creating

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	-	-	-	-	-	-	2	-	2	-
CO2	3	-	2	-	-	-	-	-	-	-	1	2	-	2	-
CO3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Course Assessment methods

Direct		Indirect
CIE test I (10) - Laboratory Quiz 1 (5) CIE test II (10) - Laboratory Quiz 2 (5)	CIE test III (10) - Project Record (10) Total CIE: **50 marks** Semester End Examination : **50 marks** SEE : Laboratory	Course end survey

LIST OF EXPERIMENTS

1	Temperature measurement using AD590 IC sensor
2	Displacement measurement by using a capacitive transducer
3	Experiment on optical Transducers- LDR, LED, Photo Transistors
4	Pressure and displacement measurement by using LVDT.
5	Tensile and compressive Load Measurement using Load Cell
6	Torque measurement using Strain gauge
7	Characteristics Study of Bio transducers – Pressure, Temperature, Humidity
8	Characteristics Study of Bio electrodes – ECG, EMG, EEG and pH electrodes.
9	Measurement of Blood Glucose Level
10	Study of PCR Kit
11	Study of Gas Sensors
12	Design a Biosensor circuit for measuring any of the body's physiological parameter.
13	Project

Practical: 30 Hrs	Project: 30 Hrs	TOTAL : 60 HOURS

Course Designer(s)	Academic Coordinator	BOS - Chairman
Prof.S.Mukesh	Dr.K.Manikandan	BME
AP / BME	AP/BME	

Dr.S.PRABAKAR M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

noc25-mg106 Design Thinking - A Primer

L	T	P	J	C
1	0	0	0	1

COURSE LAYOUT

Week 1 : Introduction to Design Thinking

Week 2 : Empathize Phase: Customer Journey Mapping

Week 3 : Analyze Phase: 5-Whys and How might we...

Week 4 : Solve Phase: Ideation: Free Brainstorming & Make/Test Phase: Prototype

Books and references
Prescribed Textbook for the course:

1. Karmic Design Thinking by Prof. Bala Ramadurai, available at Amazon (paperback), Amazon (e-book), Flipkart, Pothi, bookspace.in

References:

1. Design: Creation of Artifacts in Society by Prof. Karl Ulrich, U. Penn
2. Change by Design by Tim Brown.

Total Hours: 15 Hours

Dr.K.Manikandan
AP/BME

Dr.S.PRABAKAR M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

U23GE302	ENVIRONMENT AND CLIMATE SCIENCE	L	T	P	J	C
		2	0	0	0	0

Course Outcomes

At the end of the course, the student will be able to

CO1:	Describe the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
CO2:	Illustrate the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
CO3:	Analyze the causes, effects of various environmental pollution and their remedial measures.
CO4:	Provide solutions to combat environmental issues like global warming, acid rain, ozone Layer depletion.
CO5:	Analyze the effect of climate change in various sectors and their remedial measures.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2							-
CO2	2	-					1							-
CO3	3	2				2	3							2
CO4	3	2				2	3							2
CO5	3	2				2	2							2

Course Assessment methods

Direct		Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40)- Theory	Total CIE: **100 marks** Semester End Examination – **NIL**	Course end survey

Unit 01: INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES	**6 Hours**

Definition, Scope and Importance Forest Resources: - Use and over - exploitation, deforestation, Case Studies, Water Resources: - Use and Over-Utilization of Surface and ground water, Floods, Drought, Food Resources-Effects of Modern Agriculture, Fertilizer- Pesticide Problems-Role of an Individual in Conservati of Natural Resources.

Unit 02: ECOSYSTEMS AND BIODIVERSITY	**6 Hours**

Structure and Function of an Ecosystem-Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity-Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values-India as a Mega-Diversity Nation-Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India-Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.				
Unit 03: ENVIRONMENTAL POLLUTION				**6 Hours**
Definition – Causes, Effects and Control Measures of: - (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain – Role of an Individual in Prevention of Pollution.				
Unit 04: FUNDAMENTALS OF CLIMATE CHANGE				**6 Hours**
Sustainable Development-Climate Change- Causes and effects of Global Warming-Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy-Kyoto Protocol in reduction of greenhouse gases-Ozone Layer Depletion-mechanism, effects and control measures- Montreal Protocol to prot ozone layer depletion-Rainwater Harvesting-Effect of climate change due to air pollution Case study - CNG vehicles in Delhi.				
Unit 05: EFFECT OF CLIMATE CHANGE				**6 Hours**
Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings, consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.				
Theory: 30	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 30 Hrs**

TEXT BOOKS

1.	Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co. 2018.
2.	Anubha Kaushik and Kaushik, "Environmental Science and Engineering" New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

REFERENCES

1.	S. Radjarejesri et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2018.
2.	Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
3.	Erach, B., "The Biodiversity of India", Mapin Publishing P.Ltd.,Ahmedabad, India.
4.	Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad – 500029.

14/6/25

Dr. M.RENUGA,
Professor & Head,
Department of Humanities & Lang...
Sona College of Technology,
SALEM - 636 005.

14-6-2025

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.,
Professor of Physics
Head, Department of Sciences
Sona College of Technology (Autonomous)
SALEM-636 005.

U23GE301	SOFT SKILLS AND APTITUDE - I	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the student will be able to

CO1:	Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches
CO2:	Solve problems of greater intricacy than those in BA-I and II in stated areas of quantitative aptitude and logical reasoning
CO3:	Demonstrate higher than BA-I and II levels of verbal aptitude skills in English regarding specific topics.

Pre-requisite: Basic Aptitude I & II

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	1	1	2	2	3	3	3	1	3	1	1
CO2	3	3	3	2	2	2	1	3	3	2	1	3	2	2
CO3	1	1	1	1	1	1	1	3	3	3	1	3	1	1

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz - I (5) CIE test II (15) Quiz – II (5)	RTPS (10) Record (10) Total CIE marks : **60 marks** Semester End Examination : **40 marks**	Course end survey

1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. Attitude building b. Self-awareness and self -acceptance c. Dealing with criticism d. Innovation and creativity e. Problem solving and decision making f. Public speaking g. Group discussions.

2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Vedic Mathematics b. Simplification c. Number Properties d. Averages e. Percentage f. Profit Loss and Discount g. Ratio & Mixtures h. Equation i. Problem on Ages j. Data interpretation
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures

Theory : ---	**Tutorial : ----**	**Practical : 30hrs**	**Project : ---**	**Total hours : 30hrs**

6/06/2025

Dr.S.Anita
Professor & Head
Department of Training

Dr. S. ANITA
Professor and Head
Department of Training,
SONA COLLEGE OF TECHNOLOGY,
SALEM-636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2023 (CBCS)
Branch: Biomedical Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory Courses										
1	U23BM401	Integrated Circuits for Medical System	3	0	0	0	3	PC	45	T
2	U23BM402	Pathology and Microbiology	3	0	0	0	3	PC	45	T
3	U23BM403	Biocontrol System	3	1	0	0	4	PC	60	TT
4	U23BM404	Biomechanics	3	0	0	0	3	PC	45	T
5	U23BM405	Telemedical System	3	0	0	0	3	PC	45	T
6	U23GE402	**Audit Course**: Essence of Indian Traditional Knowledge	2	0	0	0	0	AC	30	T
Practical Courses										
7	U23BM406	Integrated Circuits for Medical System Laboratory	0	0	3	0	1.5	PC	45	L
8	U23BM407	Pathology and Microbiology Laboratory	0	0	3	0	1.5	PC	45	L
9	U23BM408	Biosignal, Data Processing with C Programming	1	0	4	0	3	PC	75	LT
10	U23GE401	Soft Skills and Aptitude – II	0	0	2	0	1	EEC	30	L
Total Credits							23			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project, P-Project

Approved By

Chairperson, Biomedical Engineering BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr.S.Prabakar	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Biomedical Engineering, Fourth Semester B.E. BME Students and Staff, COE

U23BM401	INTEGRATED CIRCUITS FOR MEDICAL SYSTEM	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Outline the basics of linear and non-linear application of operational amplifiers.
CO2:	Design an active filter, ADC and DAC using Op-amp.
CO3:	Analyze the oscillator circuits, waveform generator, IC555 timers, and IC565 Phase Locked Loops (PLL).
CO4:	Design and implement the Combinational circuits.
CO5:	Design the synchronous and asynchronous sequential circuits.

Pre-requisite:

Electronic Circuits for Medical Devices

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	-	-	-	-	-	-	1	3	2	1
CO2	3	3	3	2	1	-	-	-	-	-	-	1	3	2	1
CO3	3	3	3	2	1	-	-	-	-	1	-	1	3	2	1
CO4	3	3	3	2	1	-	-	-	-	-	-	1	3	2	1
CO5	3	3	3	2	1	-	-	-	-	1	-	1	3	2	1

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: OPERATIONAL AMPLIFIER — **9 Hours**

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Pin details -Linear applications - Inverting, Non-Inverting, summing, subtracting, averaging, Differential, Instrumentation Amplifier, Differentiators and Integrators, Non-linear applications -Comparators, Schmitt Trigger.

Unit 02: ACTIVE FILTERS AND DATA CONVERTERS — **9 Hours**

Introduction to Active Filters, LPF, HPF, Band pass, Band reject, Basic DAC, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs -Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC, Single andDual Slope ADC.

Unit 03: OP-AMP, IC-555 & IC 565 APPLICATIONS	9 Hours
Oscillators - RC Phase shift and Wein-bridge. Waveform generators - Square, triangular and sawtooth, IC555 Timer - Functional Diagram, Monostable and Astable Operations, IC565 PLL - Block Schematic, Description of Individual Blocks and IC pins, Applications.	
Unit 04: DIGITAL INTEGRATED CIRCUITS	**9 Hours**
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes –Binary, BCD, Gray, Alphanumeric codes, Boolean theorems, Various Logic Families, Logic gates, Universal gates, Sum of products and product of sums, Karnaugh map Minimization, Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder –Multiplexer, Demultiplexer, Decoder, Encoder, Priority Encoder.	
Unit 05: SEQUENTIAL LOGIC IC'S AND MEMORIES	**9 Hours**
Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, ICs details, Triggeringof FF,– state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	M. Morris Mano and Michael D.Ciletti, "Digital Design", Pearson, 6th Edition, 2018.
2.	Ramakant A. Gayakwad, "Op-Amp and Linear Integrated Circuits", Pearson, 4th Edition, 2021.

REFERENCES

1.	Herbert Taub and Donald Schilling, "Digital Integrated Electronics", Mc Graw Hill, 2017.
2.	John.F.Wakerly, " Digital design principles and practices", Pearson Education, 5th Edition, 2021.
3.	Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Mc Graw Hill Education, 3rd Edition, 2017.
4.	S Salivahanan and V S Kanchana Bhaaskaran, Linear Integrated Circuits, McGraw Hill Education, 3rd Edition, 2018.

Course Designer(s)
Prof.T.Karthikeyan
AP / BME

Academic Coordinator
Prof.K.Manikandan
AP/BME

BOS - Chairman
BME

Dr.S.PRABAKAR, M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

U23BM402	PATHOLOGY AND MICROBIOLOGY	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Explain the key concepts of cellular pathology.
CO2:	Apply the physiological mechanisms involved in fluid balance and hemodynamic disorders.
CO3:	Analyze the impact of immunological disorders and immunological assays in diagnosing and treating diseases
CO4:	Categorize microorganisms based on their structural features, classification, and associated diseases.
CO5:	Summarize the basic principles and potential applications of optical microscopes.

Pre-requisite:

Biochemistry, Biosciences for Medical Engineering

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	-	-	-	-	1	-	1	1
CO2	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1
CO3	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1
CO4	2	2	1	-	-	-	-	-	-	-	-	1	-	1	1
CO5	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: FUNDAMENTALS OF CELLULAR PATHOLOGY — **9 Hours**

Cell injury - Reversible and Irreversible cell injury, Cell Death-Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification- Dystrophic and Metastatic. Cellular adaptations to stress, Inflammation and Healing, Neoplasia - Benign and Malignant tumors – carcinogenesis - Grading and staging of tumors.

Unit 02: FLUID AND HEMODYNAMIC DISORDERS — **9 Hours**

Homeostasis – normal water and electrolyte balance, pressure gradient and fluid exchange. Edema, Thrombosis, Embolism, Ischemia, Infarction, Shock. Blood disorders – Hemophilia and Von Willebrand Disease, Haemorrhage, Leukaemia and Lymphoma.

Case study: Analysis of Clinical Conditions in Bleeding Disorder.

Unit 03: IMMUNOPATHOLOGY	9 Hours
Introduction to Immunity, Types of Immunity-Innate and acquired, Antibodies and its types, Antigen and Antibody reactions - Agglutination, Precipitation, Complement Fixation, RIA and ELISA, Immunofluorescence - Hypersensitivity reaction, Type I – IV - Auto-immune disorders - Monoclonal antibodies. Case Study: Monoclonal Antibodies in Cancer Immunotherapy.	
Unit 04: MICROBIOLOGY	**9 Hours**
Basics of microbiology – Normal flora of the human body, routes of infection and spread, endogenous and exogenous infections. Bacteria – Morphology and structural organization, growth patterns, nutritional requirements, and Tuberculosis. Virus – Influenza, Fungi – Candidiasis, Protozoa – Malaria, Helminths - Ascariasis.	
Unit 05: MICROSCOPY	**9 Hours**
Light microscope – bright field, dark field, phase contrast, fluorescence, confocal and Polarized Light Microscope - Electron microscope - TEM & SEM - Atomic Force Microscope (AFM) – Scanning Tunneling Microscope (STM).	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Harsh Mohan, Textbook of pathology, New Delhi, Jaypee brother's medical publishers, 9th edition, 2024.
2.	Vinay Kumar, Abul Abbas, Jon C. Aster, "Robbins & Cotran Pathologic Basis of Disease", 10th Edition, Elsevier, 2020.
3.	Subhash Chandra Parija, "Textbook of Microbiology and Immunology", 4th edition, Elsevier,2024.

REFERENCES

1.	James C. E. Underwood and S. S. Cross, "General and Systematic Pathology", 5th edition, Elsevier Science & Technology Publisher, 2009.
2.	Ananthanarayanan & Panicker, "Textbook of Microbiology", University press (India) Private Limited, 11th edition, 2020.
3.	Dubey RC and Maheswari DK., A Text Book of Microbiology, Chand and Company Ltd, 15th edition, 2021.
4.	Prescott, Harley and Klein, Microbiology, 10th Edition, McGraw Hill, 11th edition, 2020.
5.	Gary D. Hammer and Stephen J. McPhee "Pathophysiology of Disease: An Introduction to Clinical Medicine". 8th Edition, Mc Graw Hill Lange publication, 2018.

Course Designer(s)
Prof.K.Mythili & Prof.M.Brindha
AP / BME

Academic Coordinator
Prof.K.Manikandan
AP/BME

BOS - Chairman
BME

Dr.S.PRABAKAR, M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

U23BM403	BIOCONTROL SYSTEM	L	T	P	J	C
		3	1	0	0	4

Course Outcomes

At the end of the course, the student will be able to

CO1 :	Solve the basic control system problems.
CO2 :	Determine the time response of various systems and discuss the concept of system stability
CO3 :	Analyze the frequency response characteristics of various systems using different charts
CO4 :	Explain the basic physiological systems models and compare with the Engineering Systems
CO5 :	Analyze the time and frequency response analysis in physiological control systems.

Pre-requisite:

Signals and System for Biomedical Engineering

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	2	1	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	2	1	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: INTRODUCTION – CONTROL SYSTEM	**12 Hours**

Open and Closed loop Systems – Temperature Control System –Transfer Function – Modeling and Block Diagrams: Mechanical and Electrical - Signal flow graph representation of systems, Reduction of block diagram and signal flow graph.

Unit 02: TIME RESPONSE ANALYSIS	**12 Hours**

Step responses of first order and second order systems, time domain specifications of first and second order systems, steady state error constants. Definition of stability, Routh- Hurwitz criteria of stability, Root locus technique, construction of root locus and study of stability.

Unit 03: FREQUENCY RESPONSE ANALYSIS	**12 Hours**

Frequency domain specifications - Polar plots, Bode plots, Nyquist -Closed loop stability, Constant M and N circles. Applications.				
Unit 04: BIOLOGICAL SYSTEM MODELS				**12 Hours**
Introduction to Physiological control systems- Illustration, Linear models of physiological systems, Difference between engineering and physiological control system Distributed parameter versus lumped parameter models, Model development of Cardiovascular system- Heart model-circulatory model, Pulmonary mechanics- Lung tissue viscoelastance-chest wall- airways, Interaction of Pulmonary and Cardiovascular models, Static analysis of physiological systems – Regulation of cardiac output, Regulation of ventilation.				
Unit 05: BIOLOGICAL CONTROL SYSTEM ANALYSIS				**12 Hours**
Simple models of muscle stretch reflex action, Study of steady state analysis of muscle stretch reflex action, Study of transient response analysis of neuromuscular reflex model action, Study of frequency response of circulatory control model, Stability analysis of Pupillary light reflex				
Theory: 45 Hrs	**Tutorial: 15 Hrs**	**Practical: --**	**Project:--**	**Total Hours: 60 Hrs**

TEXT BOOKS

1.	Nagoor Kani A, Control Systems Engineering, Oxford & IBH Publishing Company Private, Limited, 2020.
2.	Michael C K Khoo, Physiological Control Systems, WILEY- IEEE Press, Prentice Hall of India, 2018.

REFERENCES

1.	Benjamin C. Kuo, Automatic Control Systems, Prentice Hall of India, 9th Edition, 2014
2.	I.J. Nagarath and M. Gopal, Control Systems Engineering, 7th Edition, Anshan Publishers. 2017. Nagoor Kani
3.	Ogata, Katsuhiko and Yanjuan Yang, Modern control engineering, Vol 4, Prentice- Hall,5th Edition, 2010.
4.	Bhattacharya and Sriman Kumar, Control systems engineering, Pearson Education India, 2nd Edition, 2012.
5.	Richard C. Dorf and Robert H. Bishop, Modern control systems, Pearson, 13th Edition, 2021.

Course Designer(s)
Prof.K.Manikandan
AP / BME

Academic Coordinator
Prof.K.Manikandan
AP/BME

BOS - Chairman
BME

Dr.S.PRABAKAR, M.E.,Ph.D.,
Professor and Head
Department of Biomedical Engineering
Sona College of Technology, Salem-5

U23BM404	BIOMECHANICS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Explain the key principles of kinetics and kinematics of human body movement.
CO2:	Analyze the forces, moments and stresses acting on various skeletal joints.
CO3:	Interpret the mechanical properties of musculoskeletal elements.
CO4:	Evaluate how biological tissues and structures interact with fluid flows.
CO5:	Summarise basic mechanics applied in sports.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	1	-	1	2	-	-
CO2	2	3	-	-	-	-	-	-	-	1	-	1	2	1	-
CO3	2	3	-	-	-	-	-	-	-	1	-	1	2	-	-
CO4	2	3	-	-	-	-	-	-	-	1	-	1	2	-	-
CO5	2	3	-	-	-	-	-	-	-	1	-	1	2	1	-

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: FUNDAMENTALS OF BIOMECHANICS — **9 Hours**

Biomechanics: Definition and Perspective, Linear and Angular Kinematics for Analysing Human Motion, Linear Kinetics and Angular Kinetics for Analysing Human Motion.

Unit 02: BIOMECHANICS OF JOINTS — **9 Hours**

Skeletal joints, forces and stresses in human joints, Analysis of rigid bodies in equilibrium, free body diagrams, Types of joints, biomechanical analysis of elbow, shoulder, spinal column, hip knee and ankle.

Unit 03: BIOMECHANICS OF MUSCULOSKELETAL SYSTEM — **9 Hours**

Hard Tissues: Mechanical properties of bone, viscoelastic properties, Maxwell & Voight models – anisotropy, Soft Tissues: Structure, Functions, Material Properties and modelling - Cartilage, Tendon, Ligament, and Muscle, Hills's muscle model.

Unit 04: BIOFLUID MECHANICS	9 Hours
Introduction, viscosity and capillary viscometer, Rheological properties of blood, laminar flow, Couette flow and Hagen Poiseuille equation, turbulent flow, Blood Flow Models, Blood Vessel Mechanics, Heart Valve Dynamics, Prosthetic Valve Dynamics. Mechanism of airflow, respiratory cycle, Lung ventilation model	
Unit 05: SPORTS BIOMECHANICS	**9 Hours**
Sports Biomechanics: Need and importance of Biomechanics & Kinesiology, Mechanics of standing, walking, running, jumping, throwing a ball and other types of motions, collisions of the human body, sustained acceleration, physics of sports, Introduction to Finite Element Analysis, Ergonomics: Ergonomic principles.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Hall, Susan J. Basic Biomechanics, Fourth Edition (Boston etc. : WCB/MC Graw-Hill Companies, 2004)
2.	Nihat Ozkaya, David Goldsheyder, Margareta Nordin Fundamentals of Biomechanics- Equilibrium, Motion, and Deformation Fourth Edition, 2017
3.	Y.C. Fung, Bio-Mechanics- Mechanical Properties of Tissues, Springer-Verlag, 1998.
4.	Lee Waite and Jerry Fine, Applied Biofluid Mechanics, The McGraw-Hill, II Edition, 2017.

REFERENCES

1.	Jay D. Humphrey, Sherry De Lange, An Introduction to Biomechanics: Solids and Fluids, Analysis and Design, Springer Science Business Media, 2004.
2.	Shrawan Kumar, Biomechanics in Ergonomics, Second Edition, CRC Press 2007.
3.	Carl J. Payton, Biomechanical Evaluation of movement in sports and Exercise, 2008.
4.	Krishna B. Chandran, Ajit P. Yoganathan and Stanley E. Rittgers, Biofluid Mechanics: TheHuman Circulation, Taylor, and Francis, 2007

Course Designer(s)
Prof.M.Brindha & Prof.M.Kiruthikha
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Academic Coordinator
Prof.K.Manikandan
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BOS - Chairman
BME

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Department of Biomedical Engineering
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U23BM405	TELEMEDICAL SYSTEM	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Explain about networks, topologies, and the key concepts.
CO2:	Elucidate the fundamentals of Telemedicine.
CO3:	Illustrate the functions and protocols used in Telemedicine Technology
CO4:	Acquire the knowledge of wireless technologies used in telemedicine.
CO5:	Apply Telemedicine Technologies in Healthcare.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	2	1	-

Course Assessment methods

Direct		Indirect
CIE test I (8) CIE test II (8) CIE test III (8) Objectives Test (6) Attendance (5)	Assignment/seminar/Quiz (5) Total CIE: **40 marks** Semester End Examination : **60 marks**	Course end survey

Unit 01: INTRODUCTION TO NETWORKS — **9 Hours**

Components – Direction of Data Flow – Networks – Components and Categories – Types of Connections – Topologies – Protocols and Standards – ISO / OSI Model – Transmission Media – Coaxial Cable – Fiber Optics – Modems – TCP/IP Model

Unit 02: FUNDAMENTALS OF TELEMEDICINE — **9 Hours**

History of telemedicine, definition of telemedicine, Functional diagram of telemedicine Sytem, Tele-health, Tele-care, scope, Telemedicine Systems, benefits & limitations of telemedicine, Organs of telemedicine, Global and Indian scenario..

Unit 03: PROTOCOLS AND STANDARS OF TELEMEDICINE — **9 Hours**

Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Standards - DICOM, HL7, H. 320 series

(Video phone based ISBN) T. 120, H.324 (Video phone based PSTN), PACS strategic plan and Architecture.	
Unit 04: TELEMEDICAL TECHNOLOGY	**9 Hours**
Audio, video, Image Data, ISDN, internet, air/ wireless communications, Wifi, Blutooth, Lifi, GSM satellite, micro wave, Mobile health and ubiquitous healthcare. Internet technology and telemedicine using world wide web (www).	
Unit 05: APPLICATIONS OF TELEMEDICINE	**9 Hours**
Introduction to robotics surgery, Teleradiology, Telecardiology, Teleoncology, Telemedicine in neurosciences, Electronic Documentation, e-health services security and interoperability., Telemedicine access to healthcare services– health education and self-care, Business aspects - Project planning and costing, Usage of telemedicine.	

Theory: 45 Hrs	**Tutorial: --**	**Practical: --**	**Project:--**	**Total Hours: 45 Hrs**

TEXT BOOKS

1.	A. S. Tanenbaum (2022), Computer Networks, 6th edition, Pearson Education/ PHI, New Delhi, India
2.	Khandpur R S, Telemedicine – Technology and Applications, PHI Learning Pvt Ltd, New Delhi, 2017.

REFERENCES

1.	Behrouz A. Foruzan, "Data Communication and Networking", 6th edition, Science Engineering & Math Publications, 2022
2.	Norris A C, Essentials of Telemedicine and Telecare, John Wiley, New York, 2002
3.	H K Huang, PACS and Imaging Informatics: Basic Principles and Applications, Wiley, New Jersey, 2010.
4.	Olga Ferrer Roca and Marcelo Sosa ludicissa, Handbook of Telemedicine, IOS Press Netherland.2002.

Course Designer(s)
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U23GE402	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	J	C
		2	0	0	0	0

	Course Outcomes
	At the end of the course, the student will be able to
CO1:	Analyze the basics of Indian Traditional knowledge in modern scientific perspectives.
CO2:	Explain the basics of Vedic science and its applications in modern days.
CO3:	Discuss the introduction and objectives of modern science.
CO4:	Describe the contribution of Noble laureates for India's achievements in Science and Technology.
CO5:	Analyze the various traditional practices for holistic health care of human beings.
	Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2			2	-							2	2
CO2	2	2	2			2	-							2	2
CO3	2	2	2			2	-							2	2
CO4	2	2	2			2	-							2	2
CO5	2	2	2			2	-							2	2

Course Assessment methods

Direct			Indirect
CIE test I (30) - Theory CIE test II (30) - Theory CIE test III (40)- Theory	Total CIE: **100 marks** Semester End Examination – **NIL**		Course end survey

Unit 01: BASIC STRUCTURE OF INDIAN KNOWLEDGE SYSTEM		**6 Hours**
Indian Traditional Scriptures, Exposure to 4 – Vedas (the Rigveda, the Yajurveda, the Samaveda and the Atharvanaveda), 4 – Upavedas (Ayurveda, Dhanurveda, Gandharvaveda, Sthapatya, etc.), 6 – Vedangas (Shiksha, Kalp, Nirukta, Vyakaran, Jyotish).		

Unit 02: INDIAN KNOWLEDGE SYSTEM AND MODERN SCIENCE		**6 Hours**
Relevance of Science and Spirituality, Science and Technology in ancient India, Superior intelligence of Indian sages and scientists.		

Unit 03: INDIAN TRADITION AND CULTURE		**6 Hours**
The Indian way of life, Introduction to Indian tradition, The Scientific Outlook and Human Values – Basics of Applied Vedic Science – modern day application of Vedas and procedure – Ancient Indian Scientific thoughts.		
Unit 04: INDIAN ARTISTIC TRADITION		**6 Hours**
Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature, etc.		
Unit 05: YOGA AND HOLISTIC HEALTH CARE		**6 Hours**
Fundamentals of yoga and holistic health – Human biology – Importance and Practice of Yoga, Pranayama and other prevailing health care techniques – Diet and nutrition – Life management – Contemporary yogic models – case study.		

Theory: 30	Tutorial: --	Practical: --	Project:--		Total Hours: 30 Hrs

REFERENCES

1. Sivaramakrishnan, V., Cultural Heritage of India- Course Material, Bharatiya Vidya Bhavan, Mumbai, 5 th Edition, 2014.
2. Capra F., Tao of Physics, Shambhala, 2010
3. Chatterjee S.C. and Datta D.M., An Introduction to Indian Philosophy, University of Calcutta, 1984.
4. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN: 9781988207049.
6. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan.

20-12-2024

Dr. C. SHANTHI, M.Sc.,M.E.,Ph.D.,
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20/12/24.

Dr. M.RENUGA,
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Sona College of Technology,
SALEM - 63

U23BM406	INTEGRATED CIRCUITS FOR MEDICAL SYSTEM LABORATORY	L	T	P	J	C
		0	0	3	0	1.5

Course Outcomes

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

CO1:	Perform mathematical operations and generate different types of waveforms using IC741 Op–Amp
CO2:	Design the various linear applications utilizing operational amplifiers
CO3:	Design and implement combinational and sequential circuits using Logic gates

Pre-requisite:

Electrical and Electronics for Medical Devices Laboratory

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	3	1	-	1	3	3	1
CO2	3	3	3	3	2	-	-	-	3	1	-	1	3	3	1
CO3	3	3	3	3	2	-	-	-	3	1	-	1	3	3	1

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE: **60 marks** Semester End Examination : **40 marks**	Course end survey

LIST OF EXPERIMENTS

1	Design of Inverting and Non-Inverting amplifier using Op-Amp (IC 741)
2	Design of Integrator and Differentiator using Op-Amp (IC 741)
3	Design of Differential amplifier to find CMRR using Op-Amp (IC 741)
4	Design of Astable and Monostable multivibrator using Op-Amp (IC 741)
5	Design of Schmitt trigger using Op-Amp (IC 741)
6	Design and implementation of Half Adder and Full Adder, Half Subtractor and Full Subtractor
7	Design and implementation of Binary to Gray and Gray to Binary Code Converters
8	Design and implementation of Multiplexer and Demultiplexer
9	Design and implementation of Asynchronous and Synchronous Counters
10	Design and implementation of Shift Registers – SISO, SIPO, PISO and PIPO
	TOTAL : 45 HOURS

Course Designer(s)
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Academic Coordinator
Prof.K.Manikandan
AP/BME

BOS - Chairman
BME
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U23BM407	PATHOLOGY AND MICROBIOLOGY LABORATORY	L	T	P	J	C
		0	0	3	0	1.5

Course Outcomes

At the end of the course, the student will be able to

CO1:	Apply appropriate microbial analysis techniques, including staining, enumeration, and motility testing, to identify and characterize microorganisms.
CO2:	Demonstrate technical expertise in culture media preparation, tissue processing, and plating techniques for diagnostic and research purposes.
CO3:	Evaluate biological samples through urine examination, blood differential counting, and staining methods to support clinical and laboratory investigations.

Pre-requisite:

Biochemistry Laboratory

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1
CO2	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1
CO3	2	2	1	-	1	-	-	-	-	-	-	1	-	1	1

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz 1 (5) CIE test II (15) Quiz 2 (5)	RTPS (10) Record (10) Total CIE: **60 marks** Semester End Examination : **40 marks**	Course end survey

LIST OF EXPERIMENTS

1	Preparation of culture media
2	Plating Techniques
3	Simple stain test
4	Gram stain test
5	AFB stain test
6	Capsule stain test
7	Test for motility (Hanging drop method)
8	Basic staining – Hematoxylin and eosin staining
9	Differential count of blood cells using Leishman's stain
10	Urine physical and chemical examination
	Demonstration
11	Enumeration of microorganisms
12	Sterilization Techniques
13	Manual paraffin tissue processing and section cutting
14	Cryo processing of tissue and cryosectioning
	TOTAL : 45 HOURS

Course Designer(s)
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AP / BME

Academic Coordinator
Prof.K.Manikandan
AP/BME

BOS - Chairman
BME
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U23BM408	BIOSIGNAL,DATA PROCESSING WITH C PROGRAMMING	L	T	P	J	C
		1	0	4	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Understand basic C programming concepts and write simple programs.
CO2:	Use arrays, strings, functions, and pointers to handle data effectively.
CO3:	Apply advanced C features to solve biomedical engineering problems.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	-	-	3	3	3	1	3	3	3	3
CO2	2	3	3	1	3	-	-	3	3	3	1	3	3	3	2
CO3	3	2	1	3	3	1	1	3	3	3	-	3	3	3	2

THEORY

UNIT – I	**INTRODUCTION**	**5**

Structure of a C Program - Data Types and Variables - Operators in C - Control Statements

UNIT II	**DATA HANDLING AND MODULAR PROGRAMMING IN C**	**5**

Arrays and Strings - Functions in C - Pointers

UNIT III	**ADVANCED CONCEPTS AND FILE HANDLING**	**5**

Structures - File Manipulations - Dynamic Memory Allocation

TEXT BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program: With an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. C, C++ and OOPS Language for Biomedical Engineering Courses: Part 1-Notes by Mohammad Sikandar Khan Lodhi, 2013
3. Gottfried B., "Programming with C", McGraw Hill Education, New Delhi, 2018.
4. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 14th edition, 2016.

REFERENCES:

1. Kernighan.B.W and Ritchie,D.M, "The C Programming language", 2. Edition,PearsonEducation, 2006.
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw Hill,2006.
3. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley(India) Pvt. Ltd., Pearson Education in South Asia, 2011.

4. E. Balagurusamy, "Programming in ANSI C", seventh edition, Tata McGraw Hill, 2016.
5. Kernighan.B.W and Ritchie,D.M, "The C Programming language", 2. Edition,PearsonEducation, 2006.

Course Assessment methods

Direct		Indirect
CIE test I (10) – Laboratory Quiz 1 (5) CIE test II (10) - Laboratory Quiz 2 (5)	CIE III (10) - Theory Record (10) Total CIE: **50 marks** Semester End Examination: **(50 marks)** SEE :Laboratory	Course end survey

LIST OF EXPERIMENTS

1	Program to calculate Body Mass Index (BMI) that demonstrates the use of operators and expressions.
2	Program using Decision-Making Statements (simple if, if..else, nested if..else, switch case) to assess the risk level of cardiovascular disease based on blood pressure readings.
3	Program utilizing Loops (while, do..while, for) to compute and display heart rate measurements over a specified duration
4	Program that utilizes a One-dimensional Array to store and analyze glucose levels over a period for monitoring diabetes.
5	Program that illustrates the use of a Two-dimensional Array for arrhythmia diagnosis.
6	Program using Strings to assess blood donation compatibility based on blood group types.
7	Program that utilizes Functions to convert temperatures between Celsius and Fahrenheit.
8	Program that uses Structures and Functions to diagnose hypotension and hypertension based on blood pressure readings.
9	Program to collect information about patients and their medical records using Nested Structures.
10	Program to collect respiration rate readings for a day in diagnosing respiratory conditions using Pointers.
11	Program to demonstrate File Operations for analyzing patient cholesterol levels.
12	Mini Project for Biomedical Applications

Theory: 15 Hrs	**Practical:** 60 Hrs	**Total:** 75 Hrs

Course Designer(s)
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U23GE401	SOFT SKILLS AND APTITUDE – II	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

At the end of the course, the students will be able to

CO1:	Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
CO2:	Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
CO3:	Demonstrate greater than SSA-I level of verbal aptitude skills in English regarding the given topics and score 65-70% marks in company-specific internal tests

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO-PO Mapping	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	1	1	1	1	1	2	2	3	3	3	1	3
CO2	3	3	3	2	2	2	1	3	3	2	1	3
CO3	1	1	1	1	1	1	1	3	3	3	1	3

Course Assessment methods

Direct		Indirect
CIE test I (15) Quiz I (5) CIE test II (15) Quiz II (5)	RTPS (10) Record (10) Total CIE marks : 60 marks Semester End Examination : 40 marks	Course end survey

1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. SWOT b. Goal setting c. Time management d. Stress management e. Mindfulness f. Interpersonal and Intrapersonal skills g. Presentation skills h. Group discussions

2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Logarithm b. Progression c. Time & Work d. Simple Interest e. Compound Interest f. Time Speed & Distance g. Plane Geometry h. Mensuration for 2D i. Mensuration for 3D j. Syllogism
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Critical reasoning b. Theme detection c. Verbal analogy d. Prepositions e. Articles f. Cloze test g. Company specific aptitude questions

Theory: 0	**Tutorial: 0**	**Practical: 30hrs**	**Project: 0**	**Total Hours: 30hrs**

12/12/2025

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