Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD)
Re-accredited with 'A++' Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

School of Engineering

B.E. Biomedical Instrumentation Engineering

Programme Specific Outcomes:

PSO1: Create engineers who can work in the field of Image Processing, Sensors & Actuators, Biomedical Instruments, Communication, MEMS and allied fields to develop innovative Biomedical systems for the public wellness and safety.

PSO2: Develop skills for design, maintenance and testing of medical equipment.

Scheme of Instruction & Examination

(For students admitted from **2024-2025** and onwards)

Part	*Course Code*	*Name of Course/component*	*Hours of Instruction/week*		*Scheme of Examination*				
			Theory	*Tutorial/ Practical*	*Duration of exam*	*CIA*	*CE*	*Total*	*Credit*
First Semester									
Induction Program including Universal Human Values (Introduction)									
I		**Humanities and Social Sciences (HS)**							
	24BEHS01	English for Technical Writing	2	0/2	3	50	50	100	3
II		**Basic Sciences (BS)**							
	24BESM01	Mathematics - I (Algebra and Calculus)	3	1/0	3	50	50	100	4
	24BESP02	Physics - Oscillation, Waves and Optics	3	0/2	3	50	50	100	4
III		**Core Courses** **Engineering Sciences (ES)**							
	24BEES01	Basic Electrical and Electronics Engineering	3	0/2	3	50	50	100	4
	24BEES02	Programming for Problem Solving using C (CSE)	3	-	3	50	50	100	3
	24BEES05	Programming for Problem Solving using C Laboratory (CSE)	-	0/2	3	50	50	100	1
	24BEES06	Engineering Practices Laboratory	-	0/4	3	50	50	100	2
IV		**Non-Credit Mandatory Courses (NCMC)**							
	24BEMC01	Environmental Science	3	-	2	100	-	100	Remark
	24EVBNS1/ 24EVBNC1/ 24EVBSP1	Value Based Elective I NSS-I/NCC-I/Sports-I	-	-	2	100	-	100	Remark
		Second Semester							
I		**Humanities and Social Sciences (HS)**							
	24BEHS02	Universal Human Values (Understanding Harmony and Ethical Human Conduct)	2	1/0	3	50	50	100	3
II		**Basic Sciences (BS)**							
	24BESM02	Mathematics-II (Laplace Transforms and Complex Variables)	3	1/0	3	50	50	100	4
	24BESC01	Applied Chemistry	3	0/2	3	50	50	100	4
III		**Core Courses** **Engineering Sciences (ES)**							
	24BEES08	Computer Aided Engineering Graphics (Civil)	2	0/2	3	50	50	100	3
	24BEES09	Programming for Problem Solving using Python (CSE)	3	-	3	50	50	100	3
	24BEES10	Electric Circuit Analysis	3	-	3	50	50	100	3
	24BEES13	Programming for Problem Solving using Python Laboratory (CSE)	0	0/2	3	50	50	100	1
	24BEES14	Electric Circuit Analysis Laboratory	0	0/2	3	50	50	100	1
IV		**Non-Credit Mandatory Courses (NCMC)**							
	24BEMC02	Constitution of India	3	-	2	100	-	100	Remark
	24EVBNS2/ 24EVBNC2/ 24EVBSP2	Value Based Elective-I NSS-II/NCC-II/Sports-II	-	-	2	100	-	100	Remark

English for Technical Writing

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester I **Hours of instruction/week: 2T+2P**

24BEHS01 **No. of credits: 3**

Course Learning Objectives:

CLO1: Comprehension of spoken and written deliberations

CLO2: Presentation in academic and professional situations

CLO3: Employability skills needed for job interviews and placement

Unit I Introduction to Technical writing 6

Technical Vocabulary/ Jargon, Word formation, Impersonal passive voice, Tenses, use of prepositions, 'if clauses', subject verb agreement, Editing, British and American English.

Unit II Internal & External Communications 6

Writing instructions and recommendations, Data interpretation, Paragraph writing, Formal letters-writing to officials (seeking permission for practical training, asking for Certificates, testimonials, calling for quotation, purchase letter, complaint letter) & Resume writing, Report Writing, E-mail writing, Framing Agendas, Minutes of the meeting.

Unit III Creative Writing 6

Designing an Advertisement, Interpreting advertisements, Slogan/caption writing, creating one's own advertisement for a product, writing blog and on social media platforms, apply best practices of technical writing to assessing new communications contexts and describing the ethical and safety issues regarding communication and the Internet.

Unit IV Speaking Skills 6

Group Discussion - GD strategies, initiating a discussion, persuasion skills, body language, ways of interrupting (non–offending), summarizing and concluding. Self-introduction, Interview skills & Mock interview.

Unit V Presentation Skills 6

Business and technical presentation, writing summary after reading articles from journals – Format for journal, articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references)

Total Hours: 30

List of Experiments:

1. Vocabulary enrichment – Word Formation
2. Justifying and Summarizing Skills – GRE, TOTEL &IELTS
3. Composing E-mails
4. Designing an advertisement
5. Self-Introduction
6. Group discussion
7. Mock Interview
8. Technical Presentation
9. Book Review
10. Public Speaking Skills

Total Hours: 30

References:

1. ***Bhushun Kumar Kul (2022)***. ***English for Technical Professionals with lab manual,*** Khanna Books Publishing Co (P) Ltd.
2. ***Hamlin Annemarie & Rubio Chris (2016).*** Central Oregon Community College, **Technical Writing**: Open Oregon Educational Resources: ISBN 13: 9781636350653 (Creative Commons Attribution Non Commercial Share Alike)
3. ***S.Sumant (2017). English for Engineers***. Tata Mcgraw Hill Education Private Limited: ISBN13: 978-8182091399.
4. ***Cindy*** **Leaney** ***(2007). Dictionary Activities***. Cambridge University Press.
5. ***Shreesh Chaudhary (2007) Better Spoken English***. Vikas Publishing House Pvt Ltd.

Course Outcomes:

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

CO 1: Construct organized academic and professional writing.

CO 2: Achieve proficiency in the effective use of language in various authentic career, related situations.

CO 3: Communicate effectively in different situations by using specific, technical vocabulary.

CO 4: Speak convincingly, express their opinions clearly, initiate a discussion, negotiate and argue using appropriate communicative strategies.

CO 5: Employ skills to face interviews and technical presentation skills.

CO-PO MAPPING

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

Mathematics – I (Algebra and Calculus)

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester I **Hours of Instruction/week: 3T+1Tu**
24BESM01 **No. of Credits: 4**

Course Learning Objectives:

CLO1: Develop skills in processing matrices and applications of differential calculus
CLO2: Enrich knowledge in solving problems in multiple integrals and ordinary Differential equations

Unit I Matrices **12**

Rank of a matrix – Consistency of a system of linear equations – Solution of a system of linear equations - Characteristic equation of matrix - Eigenvalues and Eigenvectors of a real matrix - Properties of Eigenvalues and Eigenvectors - Cayley Hamilton theorem

Unit II Orthogonal Matrices **9**

Orthogonal matrices – Orthogonal transformation of a symmetric matrix - Reduction of quadratic form to canonical form by orthogonal transformation.

Unit III Functions of Several Variables **12**

Total derivative – Taylor's series expansion - Maxima and minima - Constrained maxima and minima by Lagrangian multiplier - Jacobians.

Unit IV Multiple Integrals **12**

Double integration – Cartesian and polar coordinates –Change of order of integration – Area as a double integral - Triple integration in cartesian coordinates and spherical polar coordinates - Volume as a triple integral.

Unit V Ordinary Differential Equations **15**

Linear equations of second order with constant coefficients and variable coefficients (Homogeneous equations of Euler type) - Method of variation of parameters - Simultaneous first order linear equations with constant coefficients.

Total hours : 60

References:

1. ***T.Veerarajan (*2016*), Engineering Mathematics (for semester I and II),*** updated 2nd Edition, Tata McGraw Hill Publishing Co. Ltd, New Delhi.
2. ***P.Kandaswamy, K.Thilagavathy and K.Gunavathy(2014), Engineering Mathematics, Volume I***, 10th Revised Edition, S. Chand & Co, New Delhi.
3. ***E.Kreyszig (2014), Advanced Engineering Mathematics***, 8th Edition, John Wiley and Sons (Asia) Ltd, Singapore.
4. ***Dennis G.Zill and MichaelR.Cullen(2012),Advanced Engineering Mathematics,***2nd edition, CBS Publishers.

5. ***Srimanta Pal and Subhodh C Bhunia (2012), Engineering Mathematics,*** 9th Edition, John Wiley and Sons.
6. ***Dr.B.S.Grewal(2014),Higher Engineering Mathematics***,43rdEdition,Khanna Publishers, New Delhi.
7. ***G.B.Thomas (2009), Calculus*** **,**11thEdition, Pearson Education.

Course Outcomes:

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

CO1: Apply the concepts of matrices to solve problems in engineering.
CO2: Apply orthogonal transformation to reduce quadratic form of a matrix to canonical form.
CO3: Evaluate maxima and minima of a multivariable function.
CO4: Determine area and volume using multiple integrals.
CO5: Solve higher order linear ordinary differential equations.

CO-PO MAPPING

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

Physics - Oscillation, Waves and Optics

(Common to Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/Electronics and Communication Engineering)

Semester I **Hours of Instruction/week: 3T+ 2P**
24BESP02 **No. of credits: 4**

Course Learning Objectives:

CLO1: To impart knowledge in basic concepts of physics relevant to engineering and technology.

CLO2: To understand and apply the concepts of physics for various engineering applications.

CLO3: To impart experimental skills on potentially important experiments needed for Engineering.

Unit I Wave Mechanics **9**

Matter waves, De-Broglie's concept of matter waves, Properties of matter waves, Heisenberg's uncertainty principle, Schrödinger's time dependent and time independent equations, Schrödinger wave equation, Particle in one dimensional box, Electron microscope, Scanning electron microscope (SEM).

Unit II Ultrasonic Waves and Acoustics **9**

Introduction, Magnetostriction effect, Production of ultrasonic waves: Magnetostriction generator, Inverse piezoelectric effect, Piezoelectric generator, Properties, Ultrasonic Doppler Blood flow meter. Classification of sound, Weber- Fechner law, Absorption coefficient and its determination, Factors affecting acoustics of building and their remedies.

Unit III Optical Properties of Materials **9**

Photoconductive materials, Light Dependent Resistor, Working of LDR, Applications of LDR, Photovoltaic materials, Solar cell, Construction and working of a solar cell, Applications of solar cells, Liquid crystals, Liquid crystal Display(LCD), Construction and advantages of LCD.

Unit IV Lasers and Fiber optics **9**

Principle of spontaneous and stimulated emission, Einstein theory of stimulated emission, Population inversion, Pumping mechanism, Semiconductor laser, Application: holography. Fiber optics – Principle, Classification based on materials, refractive index profile, Applications: Fiber optic communication, Temperature sensor and Endoscope.

Unit V Waves and Oscillations **9**

Mechanical and electrical simple harmonic oscillators; damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator.

Total Hours: 45

List of Experiments (Any 10)

1. LASER- Wavelength & Particle size determination
2. Ultrasonic interferometer-Determination of compressibility of a liquid
3. Melde's apparatus- Frequency of the vibrator
4. Spectrometer- wavelength determination –Grating (Simulation Experiment).
5. Torsional Pendulum-Rigidity modulus of wire and Moment of inertia of disc.
6. Non Uniform bending – Determination of Young's Modulus.
7. LCR Bridge –Dielectric constant of Solids
8. Four Probe Apparatus-Band gap of a Semiconductor
9. Hysteresis curve tracer - Coercivity and Retentivity
10. Solar cell-V-I characteristics
11. Spectrometer- Determination of dispersive power of the prism.
12. Fiber optics – Numerical aperture

Total Hours: 30

References:

1. ***M.N.Avadhanulu, P.G.Kshirsagar, TVS Arun Murthy (2022). A Text Book of Engineering Physics***. S Chand Publications, New Delhi.
2. ***H.K.Malik, A.K.Singh (2021).Engineering Physics.*** McGraw Hill Education Private Limited, New Delhi.
3. ***D.R.Joshi (2010). Engineering Physics.*** McGraw Hill Education Private Limited, New Delhi.
4. ***S.O.Pillai (2014). A Textbook of Engineering Physics.*** New Age International (P) Limited, New Delhi.
5. ***B. B. Laud (2015). Lasers and Non-Linear Optics.*** New Age International Publications, New Delhi.
6. ***H.J. Pain (2013). The Physics of Vibrations and Waves.*** John Wiley and Sons.
7. ***Bhattacharya D.K and T.Poonam (2015). Engineering Physics***, Oxford University Press.

Course Outcomes:

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

CO1: Understand the importance of Wave Mechanics

CO2: Acquire the basic knowledge in Ultrasonics and Acoustics

CO3: Understand the principles of optical materials and devices for various engineering applications.

CO4: Understand the Principle and Applications of Lasers and Optical Fibers.

CO5: Identify the basic concepts of waves and oscillations in Engineering.

CO-PO MAPPING

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

Basic Electrical and Electronics Engineering

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester I **Hours of Instruction/week: 3T+2P**
24BEES01 **No. of credits: 4**

Course Learning Objectives:

CLO1: To impart knowledge in the basics of electrical circuits and working principles of electrical machines.

CLO2: To educate on the fundamental concepts of analog electronics, digital electronics and measuring instruments.

Unit I Electrical Circuits **9**

Circuit Components: Surface Mount Device (SMD) Components – Ohm's Law - Kirchhoff's Laws - Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state). Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power, apparent power and power factor.

Unit II Electrical Machines **9**

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

Unit III Basic Electronics **9**

Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics- Introduction to BJT and JFET (Construction, working and characteristics).

Unit IV Digital Electronics **9**

Review of number systems, binary codes (BCD, ASCII), Logic gates, Representation of logic functions - SOP and POS forms, Introduction to K-map representations - Minimization using K maps (Simple Problems only) – Adder and Subtractor (Half and Full) – Multiplexer, Demultiplexer.

Unit V Measurement and Instrumentation **9**

Functional elements of an instrument, Standards and calibration, Operating principle - Moving Coil and Moving Iron meters, Measurement of three-phase power, Instrument transformers - Current and Potentiometer Transformer, DSO- Block diagram.

Total Hours: 45

List of Experiments:

1. Verification of Ohms law.
2. Speed control of DC Motor by armature resistance control (Simulation).
3. Determination of transformer equivalent circuit from open circuit and short circuit test (Simulation).
4. VI characteristics of PN junction diode.
5. Voltage regulation using Zener Diode.
6. Implementation of Boolean Functions.
7. Implementation of Adder and Subtractor.
8. Study of Digital Storage Oscilloscope.

Total Hours: 30

References:

1. ***Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering",*** Second Edition, McGraw Hill Education, 2020.
2. ***S.K.Bhattacharya "Basic Electrical and Electronics Engineering",*** Pearson Education, Second Edition, 2017.
3. ***Sedha R.S., "A Textbook Book of Applied Electronics",*** S. Chand & Co., 2008
4. ***A.K. Sawhney, PuneetSawhney "A Course in Electrical & Electronic Measurements & Instrumentation"***, Dhanpat Rai and Co, New Delhi, 2021.

Course Outcomes:

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

CO1: Compute the simple electric circuit parameters.
CO2: Explain the working principle and test the electrical machines.
CO3: Analyze the characteristics of analog electronic devices.
CO4: Apply the basic concepts of digital electronics.
CO5: Explain the operating principles of measuring instruments.

CO-PO MAPPING

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

Programming for Problem Solving using C

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester I **Hours of Instruction /week: 3T**

24BEES02 **No. of credits: 3**

Course Learning Objectives:

CLO1: To understand the basic programming constructs for problem solving.

CLO2: To apply the basic knowledge in programming concepts and problem solving using C.

Unit I Computational Thinking and Problem Solving 9

Fundamentals of Computing – Identification of Computational Problems -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). Illustrative problems: find minimum in a list- insert a card in a list of sorted cards- guess an integer number in a range- Towers of Hanoi.

Unit II Introduction to C - Data types, Expressions and Statements 9

Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements- Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process- Introduction to Arrays: Declaration- Initialization – One dimensional array –Two dimensional arrays - String operations: length- compare- concatenate- copy – Selection sort- linear and binary search.

Unit III Functions and Pointers 9

Modular programming - Function prototype- function definition- function call- Built-in functions (string functions- math functions) – Recursion- Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value- Pass by reference.

Unit IV Structures and Union 9

Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

Unit V File Processing 9

Files – Types of file processing: Sequential access- Random access – Sequential access file - Random access file - Command line arguments.

Total Hours: 45

References:

1. ***Yashwant Kanetkar(2020). Let us C.***17th Edition, BPB Publications.
2. ***Byron S. Gottfried, Jitendar Kumar Chhabra (2018). Programming with C.***fourthedition, Tata McGraw Hill Publishing Company., New Delhi.
3. ***Paul Deitel and Harvey Deitel(*2018*).C How to Program with an Introduction to C+.*** Eighth edition, Pearson Education.
4. ***ReemaThareja (2016). Programming in C.*** Second Edition, Oxford University Press.
5. ***Kernighan, B.W and Ritchie, D.M (2015). The C Programming language.*** Second Edition, Pearson Education.

Course Outcomes:

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

CO1: Learn the basic algorithmic concepts used to solve simple computational problems.

CO2: Explain the basic constructs of C programming language.

CO3: Identify the importance of functions and pointers.

CO4: Differentiate the applications of structures and union.

CO5: Analyze the working of various file processing techniques.

CO-PO MAPPING

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

Programming for Problem Solving using C Laboratory

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester I **Hours of Instruction /week: 2P**

24BEES05 **No. of credits: 1**

Course Learning Objective:

CLO1: To understand and gain knowledge on the basic concepts in C programming language.

List of Experiments:

1. Write a C program to implement I/O Statements.
2. Write a C program to implement Operators.
3. Develop and execute a C program using Switch Case Statements.
4. Develop and execute a C program using Conditional Statements.
5. Write a C program to implement Looping Statements.
6. Develop and execute a C program for 1D & 2D-Arrays.
7. Execute a C program to perform Strings operations.
8. Write a C program to implement Functions and Recursive Functions.
9. Write a C program to implement various Parameters passing methods of Functions.
10. Write a C program to implement Structures and Unions.
11. Write a C program to implement Pointers.
12. Write a C program to implement Files.

Total Hours: 30

Software Requirements:

Turbo C

References:

1. ***Yashwant Kanetkar (2020). Let us C.***17th Edition, BPB Publications.
2. ***Byron S. Gottfried, Jitendar Kumar Chhabra (2018). Programming with C.*** *F*ourth edition, Tata McGraw Hill Publishing Company., New Delhi.
3. ***Paul Deitel and Harvey Deitel (*2018). *C How to Program with an Introduction to C*+. Eighth edition, Pearson Education.
4. ***ReemaThareja (2016). Programming in C.*** Second Edition, Oxford University Press.
5. ***Kernighan, B.W and Ritchie, D.M (2015). The C Programming language.*** Second Edition, Pearson Education.

Course Outcomes:

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

CO1: Experiment the fundamental concepts, control statements and functions in C programming.

CO2: Apply Structures, Union, Pointers and File concepts in C Programming to provide solutions to real world applications.

CO3: Analyze real world problems and use appropriate concepts in C programming to solve it.

CO-PO MAPPING

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

Engineering Practices Laboratory

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering)

Semester I **Hours of Instruction/week: 4P**
24BEES06 **No.of credits:2**

Course Learning Objectives:

CLO1: To study the hardware and software's and gain knowledge on MATLAB and Linux.

CLO2: To study the domestic wiring, measure the various electrical parameters, verify logic gates and to develop a circuit using electronic components.

List of Experiments:

Computer

PC Hardware and Software

1. System Assembling, Disassembling of parts/peripherals and Hardware Troubleshooting.

MS office

2. Create a document in MS Word which includes Formatting Fonts- Drop cap-Applying Text Effects - Using Character Spacing - Borders and Colors - Inserting Header and Footer - Using Date and Time option.
3. Create a PPT to present your assignment in MS Power Point which includes Basic power point utilities and tools like PPT Orientation – Slide layouts fa–Inserting Text-Word Art –Formatting Text-bullets and Numbering – Auto Shapes –Lines and Arrows.
4. Prepare students grade sheet in excel using basic functions like Sorting-Conditional Formatting –Embedded Chart- Formulas Setting- Page Layout – Spread the content of one cell over many cells-Merge Cells – split Cells – Filters – Freeze Panels – Interactive Buttons – Data protection.

MATLAB

5. Introduction to MATLAB – To define & use variables – vectors – Matrices & Its functions in MATLAB.
6. To study various arithmetic operators and mathematical functions in MATLAB and to create & use m-files.

Operating System

7. Installation of Windows Operating System and Working with basic Unix/ Linux commands.

Software Requirements: MS office, MATLAB and Red Hat Linux.

Electrical & Electronics

1. Residential house wiring using switches, fuse, indicator and lamps.
2. Staircase wiring.
3. Measurement of AC signal parameters (peak-peak, RMS value, period, frequency) using CRO.
4. (i) Identification and study of electronic components and equipments – Resistors, capacitors, inductors, colour coding and measurement.
   (ii) Identification and verification of logic gates.
5. Soldering and testing of simple electronic circuits.
6. Assembling and testing of simple electronic components on PCB.

Total Hours: 60

Course Outcomes:

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

CO1: Implement various tasks using MS Word, Power Point, and Excel.

CO2: Apply various commands in MATLAB and Linux.

CO3: Construct various types of domestic wiring, measure the various electrical parameters, verify logic gates and develop a circuit using electronic components.

CO-PO MAPPING

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

Environmental Science

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester I **Hours of Instruction /week: 3T**
24BEMC01 **No. of credits: NCMC**

Course Learning Objective:

CLO 1: To study the interrelationship between living organisms and environment and to help students understand the various environment problems that we face and develop possible solutions to them.

Unit I Environment, Ecosystems and Biodiversity 11

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity- definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – 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.

Field study of common plants, insects, birds.

Field study of simple ecosystems – pond, river, hill slopes, etc.

Unit II Natural Resources 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

Unit III Environmental Pollution 9

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 (g) Nuclear hazards– solid waste management: causes, effects and control measures of municipal solid

wastes – role of an individual in prevention of pollution – pollution case studies–disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

Unit IV Social Issues and the Environment 9

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act– Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

Unit V Human Population and the Environment 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health –Case studies.

Total Hours: 45

References:

1. ***Raman Sivakumar, "Introduction to Environmental science and Engineering",*** McGraw Hill Education, ISBN 13: 9780070672802, 2009.
2. ***Gilbert M.Masters, 'Introduction to Environmental Engineering and Science'***, 3rd edition, Pearson Education, ISBN-13: 9780131481930, 2008.
3. ***Benny Joseph, 'Environmental Science and Engineering'***, Tata McGraw-Hill, New Delhi, ISBN-13 9789387432352**,** 2006.
4. ***R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards'***, Vol. I and II, Enviro Media.ISBN:8186421017.
5. ***Dharmendra S. Sengar, 'Environmental law***', Prentice Hall of India Pvt. Ltd., New Delhi, ISBN-13**:** 978-8120330597, 2007.
6. ***Rajagopalan, R, 'Environmental Studies-From Crisis to Cure***', Oxford University Press, ISBN**:**9780199459759, 2005 .

Course Outcomes:

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

CO1: Will be familiar with various ecosystems and biodiversity and their importance in maintaining ecological balance.

CO2: Will be able to understand the relevance and importance of natural resources in the sustenance of life on earth.

CO3: Will be able to list different types of pollutions and their impacts on air, water and soil quality and suggest suitable measures to mitigate these impacts.

CO4: Will gain knowledge on the various environmental problems related to social issues and possible solutions to such problems.

CO5: Will be able to correlate human population growth to environmental degradation

CO-PO MAPPING

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

Universal Human Values (Understanding Harmony and Human Conduct)

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester II **Hours of instruction/week: 2T+1Tu**
24BEHS02 **No. of Credits: 3**

Course Learning Objectives:

CLO1: To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' in all the core aspirations of all human beings.

CLO2: To facilitate the development of a Holistic perspective among students towards life and profession based on a correct understanding of Human reality and the rest of existence.

CLO3: To highlight conceivable implications of such a Holistic understanding in terms of ethical human conduct and interaction with Nature.

CLO4: To provide a much-needed orientation input in value education to the young enquiring minds.

Unit I Introduction to Value Education **9**

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations

Unit II Harmony in the Human Being **9**

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Unit III Harmony in the Family and Society **9**

Harmony in the Family–the Basic Unit of Human Interaction, 'Trust'–the Foundational Value in Relationship, ' Respect'– as the Right Evaluation, Other Feelings, Justice in Human-to Human Relationship, Understanding Harmony in the Society, Vision or the Universal Human Order.

Unit IV Harmony in the Nature/Existence **9**

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

Unit V Implications of the Holistic Understanding – a Look at Professional Ethics **9**

Natural Acceptance of Human Values, Definitiveness of(Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

Total Hours: 45

References:

1. ***Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria***, Excel Books, New Delhi, 2010.
2. ***JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan***, Amarkantak,1999.
3. ***Human Values, A.N. Tripathi***, New Age Intl. Publishers, New Delhi, 2004.
4. ***The Story of Stuff (***Book).
5. ***The Story of My Experiments with Truth*** - by Mohandas Karamchand Gandhi
6. ***Small is Beautiful*** - E. F Schumacher.
7. ***Slow is Beautiful*** - Cecile Andrews
8. ***Economy of Permanence*** - J C Kumarappa
9. ***Bharat Mein Angreji Raj***–PanditSunderlal
10. ***Rediscovering India*** - by Dharampal
11. ***Hind Swaraj or Indian Home Rule*** - by Mohandas K. Gandhi
12. ***India Wins Freedom*** - Maulana Abdul Kalam Azad
13. ***Vivekananda*** - Romain Rolland (English)

Course Outcomes:

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

CO1. Understand the human reality and the rest of Existence.
CO2. Comprehend towards what they have understood on human values and relationship.
CO3. Apprehend the interconnectedness, the interdependence, the harmony all around the society.
CO4. Develop the holistic perception towards nature.
CO5. Transform from personnel to Value-based Life and Profession.

CO-PO MAPPING

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

Mathematics – II (Laplace Transforms and Complex Variables)

(Common to Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/Electronics and Communication Engineering/Food Technology)

Semester II **Hours of Instruction/week:3T+1Tu**
24BESM02 **No. of Credits:4**

Course Learning Objectives:
CLO1: To enhance knowledge in Laplace transforms, vector calculus and its applications.
CLO2: To understand the concepts of complex integration and contour integration.

Unit I Laplace Transform 12

Laplace transform - Definition and sufficient conditions - Transforms of functions - Properties of Laplace transforms - Transforms of derivatives and integrals – Initial value theorem - final value theorem - Transform of periodic functions

Unit II Inverse Laplace Transform 12

Inverse Laplace transform - Properties of inverse Laplace transforms - Convolution theorem - Application to solution of linear ordinary differential equations upto second order with constant coefficients.

Unit III Analytic Functions 12

Function of a complex variable – Analytic function – Necessary conditions-Cauchy – Riemann equations in cartesian coordinates - Sufficient conditions (Proof not included)-Properties of analytic function – Determination of harmonic conjugate by Milne– Thomson method – Conformal mapping – $w = z + a$, az, $1/z$

Unit IV Complex Integration 12

Statement and application of Cauchy's theorem and Cauchy's integral formula – Laurent's expansion – Singularities – Classification – Residues – Cauchy's residue theorem - Contour integration - Unit circle and semi-circular contours (excluding poles on real axis).

Unit V Vector Calculus 12

Gradient - Divergence and Curl – Green's - Gauss divergence and Stoke's theorems (without proof) - Verification of the above theorems and evaluation of integrals using them.

Total Hours: 60

References:

1. ***T.Veerarajan (*2016*), Engineering Mathematics (for semester I and II),*** updated 2nd Edition, Tata McGraw Hill Publishing Co. Ltd, New Delhi.
2. ***P.Kandaswamy, K.Thilagavathy and K.Gunavathy (2014), Engineering Mathematics,*** 10th Revised Edition, S. Chand & Co, New Delhi.
3. ***E.Kreyszig (2014), Advanced Engineering Mathematics***, 8th Edition, John Wiley and Sons (Asia) Ltd, Singapore.
4. ***Dennis G.Zill and Michael R.Cullen (2012), Advanced Engineering Mathematics,*** 2nd Edition, CBS Publishers.

5. ***Srimanta Pal and Subhodh C Bhunia (2012),Engineering Mathematics,*** 9th Edition**,** John Wiley and Sons.
6. ***Dr.B.S.Grewal (2014), Higher Engineering Mathematics***, 43rd Edition, Khanna Publishers, New Delhi.
7. ***Jain R.K. and Iyengar S.R.K. (2007), Advanced Engineering Mathematics,*** 3rd Edition, Narosa Publications, New Delhi.

Course Outcomes:

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

CO1: Apply Laplace transform techniques to solve engineering problems.
CO2: Determine inverse Laplace transforms of various functions.
CO3: Construct analytic functions of complex variables and interpret its transformations.
CO4: Evaluate real and complex integrals using the techniques of complex integration.
CO5: Analyse vector differentiation and vector integration in real world problems.

CO-PO MAPPING

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

Applied Chemistry

(Common to Biomedical Instrumentation Engineering and Electronics and Communication Engineering)

Semester II **Hours of Instruction/week: 3T+2P**
24BESC01 **No. of credits:4**

Course Learning Objectives:

CLO1: To provide students with a background in important concepts and principles of Chemistry and use the knowledge gained to describe and solve real technological problems.

CLO2: To impart experimental skills and hands on experience in the use of analytical equipment needed for engineering applications.

Unit I Electrochemistry and Storage Devices 9

Electrochemical cells: Electrode potential, Nernst equation (problems). Reference electrodes: Calomel electrode, glass electrode and measurement of pH, EMF, electrochemical series and its significance. Energy Storage Devices Primary and Secondary Cells, Lechlanche cell, Lead Acid Battery, Nickel Cadmium Battery, Lithium Battery, Charging and Discharging reactions

Unit II Corrosion and its Control 9

Chemical and electrochemical corrosion: principle, mechanism, galvanic corrosion, differential aeration corrosion. Factors influencing corrosion.
Corrosion control: Selection of materials and proper designing, sacrificial anode and impressed current cathodic protection methods, corrosion inhibitors.

Unit III Polymers and Green Chemistry 9

Introduction: Functionality-degree of polymerization. Classification of polymers - Natural and synthetic, thermoplastic and thermosetting. Types of polymerization, mechanism of free radical polymerization, Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Conducting polymers, types, mechanism of conduction and Applications. Green chemistry- Introduction and need for green chemistry, Principles of green chemistry.

Unit IV Nanochemistry 9

Nanomaterials –Types – Size dependence of properties, electrical, optical, magnetic and mechanical properties. Synthesis: sol-gel, electrode position and laser ablation. Characterization – Scanning Electron Microscope and Transmission Electron Microscope Principle and Instrumentation (block diagram). Applications of nanomaterials – medicine, agriculture and electronics.

Unit V Photochemistry and Spectroscopy 9

Photochemistry: Laws of photochemistry-Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo processes - fluorescence, phosphorescence and photo-sensitization. Spectroscopy: Electromagnetic spectrum-absorption of radiation-electronic, vibrational and rotational transitions. Estimation of concentration of a coloured solution by colorimetry, UV-Visible and NMR spectroscopy- principles, instrumentation (Block diagram only) and applications.

Total Hours: 45

List of Experiments

1. **pHmetry**
   To find out the strength of given hydrochloric acid by sodium hydroxide.
2. **Conductometry**
   a. Estimation of strength of acids in a mixture of acids.
   b. Estimation of Barium Chloride using Sodium Sulphate.
3. **Potentiometry**
   Estimation of ferrous ion in the given solution.
4. Determination of total hardness of water by EDTA method.
5. Determination of chloride content of water sample by argentometric method.
6. **Corrosion Experiment**
   Weight Loss method
7. Synthesis of a polymer
8. **Viscometry**
   Determination of molecular weight of a polymer
9. Estimation of concentration of a coloured solution using colorimeter
10. **Spectrophotometry**
    Estimation of iron content of water sample

Total Hours: 30

References:

1. ***Jain P. C. & Monika Jain (2015). Engineering Chemistry***. Dhanpat Rai Publishing Company (P) Ltd, New Delhi, ISBN 13: 9788187433170.
2. ***Vairam S., Suba Ramesh (2013) Engineering Chemistry***. Wiley India Pvt Ltd., New Delhi., ISBN 13: 9788126544752.
3. ***ShashiChawla (2013). A Text Book of Engineering Chemistry.*** Dhanpat Rai& Co Pvt. Ltd. 3rd Edition, 10thReprint.
4. ***Dara S.S.,Umare S.S (2010). Engineering Chemistry*. 12th edition,** S.Chand & Company Pvt.Ltd, New Delhi., ISBN : 81-219-0359-9.
5. ***PalannaO.G (2017). Engineering Chemistry***.**2nd Edition**, McGraw-Hill Education (India) Pvt. Ltd.,Chennai, ISBN:9789352605774.
6. ***Kannan P., Ravikrishnan A (2014). Engineering Chemistry***. Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai.
7. ***Dr.Rakesh Kumar, Dr. Kamala Pati Tiwary (2013). A Textbook of Nano Science*** 2nd Edition, S.K.Kataria & Sons, New Delhi.

Course Outcomes:

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

CO1: Apply the principle of electrochemistry in the functioning of energy storage devices.
CO2: Identify the causes of corrosion and the possible techniques to minimise corrosion.
CO3: Familiar with the essential aspects of polymer chemistry and the importance of green chemistry
CO4: Get acquainted with the basics of nano materials, their characterisation and applications.
CO5: Acquire a basic knowledge about the spectroscopic techniques used for the analysis of materials.

CO-PO MAPPING

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

Computer Aided Engineering Graphics

(Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Electronics and Communication Engineering/Food Technology)

Semester II **Hours of Instruction/week: 2T+3P**

24BEES08 **No. of credits: 3**

Course Learning Objective:

CLO1: The objective of this course is to develop the students in graphic skill for communication of concepts and ideas in engineering field using AutoCAD software.

Unit I Introduction to Computer Aided Engineering Graphics 15

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Geometrical Constructions.
Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Unit II Projection of Points, Lines and Planes 15

Introduction to Orthographic projections: orthographic projection of points.
Projection of straight lines located in the first quadrant only, determination of true length and true inclination.
Projections of plane surfaces like polygonal lamina and circular lamina, located in first quadrant only.

Unit III Projection of Simple Solids 15

Projection of simple solids like prism, pyramid, and cylinder, Drawing views when the axis of the solid is inclined to one reference plane.

Unit IV Sectioning of Solids 15

Sectioning of simple solids like prisms, pyramids, cylinder, cone and sphere. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.

Unit V Isometric, Perspective Projection and freehand sketching 15

Isometric projections, Isometric scale, Isometric views of simple solids, Free hand sketching techniques, sketching of orthographic views from given pictorial views of objects, including freehand dimensioning. Sketching pictorial views from given orthographic views. Perspective projections of solids.

Total Hours: 45

References:

1. ***Venugopal.K , "Engineering Graphics",*** New Age International (P) Limited, 2008.
2. ***Natarajan K.V, "Engineering drawing and graphics",*** 17th Edition, Private Publisher, Chennai, 2008.
3. ***Bhatt.N.D, "Engineering Drawing" ,*** Charotar Publishing House, 2011.

4. ***Kumar M.S, "Engineering Graphics"***, Ninth edition. D.D. Publications, Chennai, 2007.
5. ***Warren J, Luzadder and John.M.Duff , "Fundamentals of Engineering Drawing"***, Eleventh edition. Prentice Hall of India Pvt., Ltd., 2007.
6. ***Gopalakrishnan K.R*, *"Engineering Drawing (Vol.I& II)",*** Subhass Publications, 2007.
7. ***Bertoline and Wiebe, "Fundamentals of graphics Communication",*** Third edition. McGrawhill, 2007.
8. ***Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD",*** Tata McGraw Hill Publishing Company Limited, 2008.

Course Outcomes:

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

CO1: Use various commands in AutoCAD Software.
CO2: Draw orthographic projection of points, lines and plane surfaces.
CO3: Sketch projections of solids.
CO4: Draw projections of sections of solids.
CO5: Prepare isometric and perspective sections of simple solids.

CO-PO MAPPING

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

Programming for Problem Solving using Python

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester II **Hours of Instruction /week: 3T**

24BEES09 **No. of credits: 3**

Course Learning Objectives:

CLO1: To understand the basic knowledge in programming concepts and Problem solving using Python.

CLO2: To acquire knowledge on Python data structures, functions, modules and packages.

Unit I Introduction to Python Programming Language 9

Introduction to Python Language and installation- overview on python interpreters- working with python- Numeric Data Types: int- float- Boolean- complex and string and its operations- Standard Data Types: List- tuples- set and Dictionaries- Data Type conversions- commenting in python.

Unit II Variables and Operators 9

Understanding Python variables - Multiple variable declarations - Python basic statements- Python basic operators: Arithmetic operators - Assignment operators - Comparison operators- Logical operators- Identity operators - Membership operators - Bitwise operators - Precedence of operators- Expressions.

Unit III Control Flow and Loops 9

Conditional (if)- alternative (if-else)- chained conditional (if- elif -else)- Loops: For loop using ranges-string- Use of while loops in python- Loop manipulation using pass- continue and break- Regular Expression

Unit IV Functions 9

User Defined Functions- Calling Functions- passing parameters and arguments- Python Function arguments: Keyword Arguments- Default Arguments- Variable-length arguments- Anonymous Functions- Fruitful Functions (Function Returning Values)- Scope of the Variables in a Function - Global and Local Variables- Powerful Lambda functions in python- classes and objects.

Unit V I/O Error Handling, Modules and Packages 9

Introduction- Access Modes- Writing Data to a File- Reading Data from a File- Additional File Methods- Introduction to Errors and Exceptions- Handling IO Exceptions- Run Time Errors- Handling Multiple Exceptions. Modules: Importing Module - Packages - Compositions.

Total Hours: 45

References:

1. ***Paul Deitel and Harvey Deitel (2021).Python for Programmers.*** Pearson Education. First Edition.
2. ***John V Gutta- (2021).Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data.*** Third Edition. MIT Press.
3. ***Eric Matthes (2019). Python Crash Course, A Hands - on Project Based Introduction to Programming.*** Second Edition. No Starch Press.
4. ***Martin C. Brown, "The Complete reference – Python",*** Tata McGraw hill edition 2018.
5. ***Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python",*** Network Theory Ltd., 2011.

Course Outcomes:

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

CO1: Explain the basic constructs of python programming language.
CO2: Learn the various types of variables and operators in Python.
CO3: Acquire the knowledge on control statements.
CO4: Learn the concepts of functions.
CO5: Infer the file operations, exception handling, modules and packages in Python.

CO-PO MAPPING

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

Electric Circuit Analysis

(Common to Biomedical Instrumentation Engineering/ Electronics and Communication Engineering)

Semester II **Hours of Instruction/week: 3T**
24BEES10 **No. of credits: 3**

Course Learning Objectives:

CLO1: To introduce the basic concepts of DC and AC circuits and analyse the transient and steady state response.

CLO2: To introduce different methods of circuit analysis using Network theorems, duality and topology.

Unit I Basic Circuits Analysis **9**

Basic Components of Electric Circuits: Charge, Current, Voltage and Power, Voltage and Current Sources, Single – Loop Circuit, Single- Node Pair Circuit, Series and Parallel Connected Sources, Resistors in Series and Parallel, Voltage and Current Division, Mesh and Nodal Analysis for DC circuits, Supermesh and Supernode Analysis.

Unit II Network Theorem **9**

Useful Circuit Analysis Techniques: Linearity and Superposition, Thevinin's and Norton Equivalent Circuits, Maximum Power Transfer, Reciprocity Theorem, Millman's Theorem. Source transformation: Delta-Wye Conversion.

Unit III Sinusoidal Steady State Analysis **9**

Sinusoidal Steady - State Analysis: Characteristics of Sinusoids, Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, Impedance and Admittance, Nodal and Mesh Analysis (RLC circuit), Phasor Diagrams.
AC Circuit Power Analysis: Instantaneous Power, Average Power, Apparent Power and Power Factor, Complex Power.

Unit IV Transient Analysis **9**

Basic RL and RC Circuits, Source- Free RL Circuit, Source-Free RC Circuit, Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response: Parallel Resonance, Series Resonance and Quality Factor.

Unit V Coupled Circuits and Topology **9**

Magnetically Coupled Circuits, Self Inductance, Mutual Inductance, Linear Transformer. An Introduction to Network Topology: Graphs and Trees, Network Incidence Matrices, Basic cut-set and tie-set matrices, Loop and Nodal Analysis.

Total Hours: 45

References:

1. ***Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis",*** McGraw Hill education, 9th Edition, 2020.
2. ***Robert.L. Boylestead, "Introductory Circuit Analysis",*** Pearson Education India, Twelfth Edition, 2014.
3. ***Charles.K.Alexander, Mathew N.O.Sadiku," Fundamentals of Electric Circuits",*** McGraw Hill, Seventh Edition, 2020.
4. ***Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice",*** Cengage Learning, Fifth Edition, 1st Indian Reprint 2013.

Course Outcomes:

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

CO1: Apply the basic concepts of circuit analysis such as Kirchhoff's laws, mesh current, and node voltage method for the analysis of DC and AC circuits

CO2: Analyze AC and DC circuits using suitable network theorem.

CO3: Examine steady-state response of any R, L and C circuits.

CO4: Analyse the transient response of RLC Circuits

CO5: Explain the concepts of coupled circuits and network topology.

CO-PO MAPPING

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

Programming for Problem Solving using Python Laboratory

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester II **Hours of Instruction /week: 2P**

24BEES13 **No. of credits: 1**

Course Learning Objective:

CLO1: To understand and gain knowledge on the basic concepts in Python Programming language.

List of Experiments:

1. Implement basic Python programs using various data types and to declare a variable in different possible ways.
2. Create a string and perform various string operations.
3. a. Create a list and perform the operations such as insert, remove, append, len, pop and clear.
   b. Create a tuple and perform the g operations such as add items, len, check for item in tuple.
4. Create a Dictionary and perform the operations such as print the dictionary items, access items, use get(), change values, use len().
5. Write a Python program to perform arithmetic, logical, assignment and comparison operators.
6. Implement a Python program using Conditional Statements.
7. Implement a Python programs using Looping Statements.
8. Implement a Python programs using Functions.
9. Write a Python program to double a given number and add two numbers using lambda().
10. Write a Python program to implement filter() to filter only even numbers from a given list.
11. Write a Python program to implement map() function to double all the items in the list.
12. Implement a real-time applications using Exception handling(divide by zero error, voter's age validity, student mark range validation).

Total Hours: 30

Software Requirements:

Python IDE.

References:

1. ***Paul Deitel and Harvey Deitel (2021).Python for Programmers.*** Pearson Education. First Edition.
2. ***John V Gutta- (2021).Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data.*** Third Edition. MIT Press.
3. ***Eric Matthes (2019). Python Crash Course, A Hands - on Project Based Introduction to Programming.*** Second Edition. No Starch Press.
4. ***Martin C. Brown, "The Complete reference – Python",*** Tata McGraw hill edition 2018.
5. ***Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python",*** Network Theory Ltd., 2011.

Course Outcomes:

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

CO1: Experiment the fundamental concepts, control statements and functions in Python programming.

CO2: Apply sequence data types concepts in Python programming to provide solutions to solve real world applications.

CO3: Analyze the real world problems and use appropriate concepts in python to solve it.

CO-PO MAPPING

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

Electric Circuit Analysis Laboratory

(Common to Biomedical Instrumentation Engineering/ Electronics and Communication Engineering)

Semester II **Hours of Instruction/week: 2P**
24BEES14 **No. of credits:1**

Course Learning Objective:

CLO1: To make the students verify the basic network theorems and analyze the frequency response of basic circuits.

List of Experiments:

1. Verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Verification of electrical circuit problems using Thevinin's Theorem.
3. Verification of electrical circuit problems using Norton theorem
4. Verification of electrical circuit problems using Super Position Theorem.
5. Verification of electrical circuit problems using Maximum Power Transfer Theorem.
6. Verification of Reciprocity Theorem.
7. Verification of Millman's Theorem.
8. Transient analysis of RL and RC circuits.
9. Determine the frequency response of RLC electric circuit.
10. Design and Simulation of series resonance circuit.
11. Design and Simulation of parallel resonance circuit.
12. Study on functioning of Spectrum Analyzer.

Total Hours: 30

Course Outcomes:

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

CO1: Analyze and verify the basic network theorems

CO2: Analyze the transient response of RLC circuits.

CO3: Design and simulate the frequency response of resonance circuits.

CO-PO MAPPING

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

Constitution of India

(Common to Artificial Intelligence and Data Science/ Biomedical Instrumentation Engineering/Civil Engineering with Computer Application/ Computer Science and Engineering/ Computer Science and Engineering (Artificial Intelligence and Machine Learning)/ Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)/Electronics and Communication Engineering/Food Technology)

Semester II **Hours of Instruction/week:2T**
24BEMC02 **No. of Credits: NCMC**

Course Learning Objectives:

CLO1: To know about historical background of the constitution making and its importance for building a democratic India.
CLO2: Elucidate the functioning of three wings of the government i.e., executive, legislative and judiciary.
CLO3: Expound the value of the fundamental rights and duties for becoming good citizen of India.
CLO4: Analyse the decentralization of power between central, state and local self-government.

Unit I History of Making of the Indian Constitution 6

History, Drafting Committee,(Composition & Working), Philosophy of the Indian Constitution-Preamble, Salient Features

Unit II Contours of Constitutional Rights & Duties 6

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit III Organs of Governance 6

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit IV Local Administration 6

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, Panchayatraj: Introduction, PRI: Zila Pachayat. Elected officials and their roles

Unit V Election Commission 6

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Total Hours: 30

References:

1. ***The Constitution of India, 1950(BareAct),*** Government Publication.
2. **M.V.Pylee, "*Introduction to the Constitution of India*",** 4th Edition, Vikas publication, 2005.
3. ***Durga Das Basu, "Introduction to the constitution of India", (***Student Edition), 19th edition, Prentice-Hall EEE, 2008.

Course Outcomes:

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

CO1: Comprehend the history of Indian Constitution and the various schedules under it.

CO2: Exercise the fundamental rights in proper sense at the same time identifies his/her responsibilities in national building.

CO3: Appreciate and discuss the basic components of Indian constitution, Constitutional rights and duties and various Organs of Governance

CO4: Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail

CO5: Understand Electoral Process, Emergency provisions and Amendment procedure.

CO-PO MAPPING

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