2025-2029

1st YEAR

	TYPE OF COURSE	COURSE CODE	COURSE NAME	**OFFERING DEPARTMENT	*COURSE NATURE(NEP)	L	T	P	CONTACT HOURS	NO. OF CREDITS
SEM-1	BSC	4.5MA01O001	CALCULUS & LINEAR ALGEBRA	MA	MULTIDISCIPLINARY	3	1	0	4	4
	ESC	4.5CS02O0001	PROGRAMMING FOR PROBLEM SOLVING USING C	CS	MULTIDISCIPLINARY	2	0	0	2	4
		4.5CS02O0101	PROGRAMMING FOR PROBLEM SOLVING USING C LAB			0	0	4	4	
	BSC	4.5CH01O0004	ENVIRONMENTAL SCIENCES	CHEM	MANDATORY COURSES	2	0	0	2	0
	HSMC	4.5ED03O0001	PROFESSIONAL ENGLISH	ED	AEC/SEC	1	0	0	1	2
			PROFESSIONAL ENGLISH LAB			0	0	2	2	
	BSC	4.5EC02O0004	FUNDAMENTALS OF ELECTRONICS & ELECTRICAL ENGINEERING	ECE	MULTIDISCIPLINARY	3	0	0	3	4
		4.5EC02O0104	FUNDAMENTALS OF ELECTRONICS & ELECTRICAL ENGINEERING LAB			0	0	2	2	
	PCC	4.5CS07O1001	WEB DESIGNING-I	CS	CORE	0	0	2	2	1
	ESC	4.5CD08O0001	COMPUTER AIDED DRAFTING	ME	MULTIDISCIPLINARY	0	0	2	2	1
	HSMC	4.5CD08O0001	Personal & Interpersonal Communication	CDC	AEC/SEC	2	0	0	2	1

	ESC	4.5EC07O105	ENGINEERING EXPLORATION-I	MRIIF		0	0	2	2	1
			Total			**13**	**1**	**14**	**28**	**18**
AIML	PCC	4.5CS05O002	DATA MODELLING	CS	CORE	1	0	0	1
		4.5CS05O102	DATA MODELLING LAB			0	0	2	2
FSD	PCC	4.5CS05O003	DIGITAL TRANSFORMATION & AGILE DEVELOPMENT	CS	CORE	1	0	0	1
		4.5CS05O103	DIGITAL TRANSFORMATION & AGILE DEVELOPMENT LAB			0	0	2	2
CSTI	PCC	4.5CS05O004	Introduction to Cybersecurity	CS	CORE	2	0	0	2
		4.5CS05O104	Introduction to Cybersecurity Lab			0	0	2	2
			Total AIML			**14**	**1**	**14**	**29**
			Total FSD			**14**	**1**	**14**	**29**
			Total CSTI			**15**	**1**	**14**	**30**

Course Title/Code	**CALCULUS AND LINEAR ALGEBRA/ 4.5MA01O001**
Course Type	**Core (Allied)**
Course Nature	**Hard**
L-T-P-O Structure	**(3-1-0)**
Objective	**The objective of the course is to equip students with fundamental knowledge of calculus and linear algebra such as differential and integral calculus, vector spaces, and matrix algebra (WK), enable them to apply these concepts to solve application-based problems in engineering and computer science (SK), and foster analytical thinking, mathematical precision, and a positive attitude towards the application of mathematics in computing disciplines (AK).**
Course Outcome	**The students would be able to** **CO1: Describe (BT2) foundational knowledge of differential and integral calculus, vector spaces, and matrix algebra relevant to computer science applications.** **CO2: Apply (BT3) calculus and linear algebra techniques to solve problems such as optimization, systems of equations, and linear transformations in computing contexts.** **CO3: Analyze (BT4) mathematical problems using logical reasoning and the tools of calculus and linear algebra to evaluate computational models.** **CO4: Demonstrate (BT4) a structured and analytical approach to solving real-world problems in computer science through mathematical modeling and precision.**

SECTION – A

Differential Calculus: Higher order derivatives, Limit, continuity and differentiability of function of several variables, Partial derivatives, Homogeneous function and Euler's theorem, Differentiation of composite functions, Maxima-Minima and Taylor's theorem for function of two variables.

SECTION – B

Integral Calculus: Double and Triple integration, change of order of integration, change of variables, Applications of multiple integrals such as surface area and volume.

SECTION – C

Linear Algebra: Elementary operations, inverse of a matrix, rank and solution of linear simultaneous equations, Vector spaces (over the field of real numbers), subspaces, spanning set, linear independence, basis and dimension. Linear transformations, range and null space, rank-nullity theorem, matrix of a linear transformation.

SECTION – D

Matrix Algebra: Orthogonal, symmetric, skew-symmetric, Hermitian, skew-Hermitian, normal and unitary matrices and their elementary properties, Eigenvalues, eigenvectors, symmetric, skew-symmetric and orthogonal Matrices, Eigen bases. Cayley-Hamilton theorem, Diagonalization of a matrix.

Text/Reference Books:

(i) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(ii) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

(iii) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

(iv) Advance Engineering Mathematics by H K Das

(v) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010

Course	Program Outcomes	PSO 1	PSO 2

Outcomes	1	2	3	4	5	6	7	8	9	10	11		
CO1	3	2											
CO2	3	3											
CO3	2	3											
CO4	2	2											

Course Title/Code	**Programming for Problem solving using C(**4.5CS02O001**)**	
CCourse Type	Core	
L-T-P Structure	2-0-0	
Credits	2	
Prerequisites	NIL	
Course Objective	The students (A) will be able to apply C programming concepts (B) using programming skills (C) to design solutions to solve elementary problems (D).	
Course Outcomes (COs)		Mapping
CO1	Demonstrate foundational skills to solve simple programming problems.	Employability
CO2	Build modular code and manage data efficiently using sequential structures.	Employability
CO3	Apply programming skills to manage and search memory efficiently.	Employability/ Skill Development
CO4	Solve simple problems of organizing, storing and retrieving data using files.	Employability/ Skill Development

SECTION-A

Introduction: History, Compilation, and Execution, Hierarchy and Associativity of Operations, data types, constants, and variables, Statements, Expressions, Structured Programming.

The Decision Control Structure: Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, switch statement.

SECTION-B

Loops: The while Loop, for Loop, nesting of Loops. Odd Loop, break and continue, The do-while Loop, Use of Logical Operators, infinite loop.

Functions: Modular programming, functions, importance of functions, passing values between functions, scope rule, calling convention, function call, function declaration and prototypes, call by value and call by reference, Standard Library of C functions, return type, recursion.

Arrays: What are Arrays, initialization, passing Array Elements to a Function, Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Null terminated strings as array of characters, Pointers and Arrays, Memory Map of a 2-Dimensional Array.

SECTION-C

Pointers: An Introduction to Pointers, pointer Notation, Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, back to Function Calls, recursion, Call by Reference, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

Searching: Linear, binary search.

Strings: Introduction, pre-defined Standard library string functions.

SECTION-D

Structures:

Use, Declaring a Structure, Structure variables, initialization, structure assignment, Accessing Structure Elements, How Structure Elements are Stored, Array of Structures, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, Break, Continue and Goto, Type Conversion; Enumerations; Macros.

File Handling: Pointers to a file, Opening a file, modes for opening the file, reading and writing from a file, writing structures in a file, functions for seeking and moving in the file.

Text Books:

1. E. Balagurusamy, “Programming in ANSI C”, McGraw Hill Education, 7th Edition, 2017.
2. Byron Gottfried, “Programming with C”, Schaum's Outlines, 3rd Edition, 2017.

Reference Books:

1. Herbert Schildt, “C: The Complete Reference”, McGraw Hill Education, 4th Edition, 2000.

2. Yashavant Kanetkar, “Let Us C”, BPB Publications, 16th Edition, 2017.

3. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, Prentice Hall, 2nd Edition, 1988.

CO-PO Mapping

Course Outcomes	Programme Outcomes											PSO 1	PSO 2
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11		
CO1: Demonstrate foundational skills to solve simple programming problems.	3	-	-	-	3	-	-	-	-	-	2	2	2
CO2: Build modular code and manage data efficiently using sequential structures.	3	2	2	-	3	-	-	-	-	-	2	2	2
CO3: Apply programming skills to manage and search memory efficiently.	3	2	2	-	3	-	-	-	-	-	2	3	2
CO4: Solve simple problems of organizing, storing and retrieving data using files.	3	2	2		3			1	-	-	3	2	2

Course Title/Code	**Programming for Problem solving using C(4.5CS02O001)**	
Course Type	Core	
L-T-P Structure	0-0-4	
Credits	2	
Prerequisites	NIL	
Course Objective	The students (A) will be able to apply C programming concepts (B) using programming skills (C) to design solutions to solve elementary problems (D).	
Course Outcomes (COs)		Mapping
CO1	**To demonstrate programming skills for solving elementary problems.**	Skill Development
CO2	**To implement procedural programming to solve data organization and management problems.**	Skill Development

LIST OF PROGRAMS

1. Basic programs in C, use of if-else construct and switch-case construct.
2. Programs on loops (for, while, do-while) and use of break and continue statements.
3. Programs on functions: call by value, call by reference, recursion.
4. Programs on 1D arrays.
5. Programs on strings and use of standard string library functions.
6. Programs on pointers and pointer arithmetic.
7. Programs using functions and pointers together (e.g., call by reference).
8. Programs on arrays of structures and nested structures.
9. Programs on linear search techniques.
10. Programs on file handling: reading from and writing to files.

CO-PO Mapping for Lab

Course Outcomes	**Programme Outcomes**											PSO 1	PSO 2
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		
CO1: To demonstrate programming skills for solving elementary problems.	3	2	2	-	3	-	-	-	-	-	2	2	2
CO2: To implement procedural programming to solve data organization and management problems.	3	2	2	-	3	-	-	1	-	-	3	2	2

Course Title/ Code	**Environmental Sciences/ Course Code 4.5CH01O004**
Course Type	Core
L-T-P Structure	(2-0-0)
credits	0
Objectives	Students (A) would be able to apply (B) basics of Environmental Science (C) to Identify areas of environmental degradation (D) and would be able to suggest possible solutions to control or to prevent the same.

Course Outcome:
After completion of this course, students would be able to:

CO1: Explain the relationship between human activities, culture (including Indic knowledge), and the environment in the context of sustainability, based on their influence on ecological balance and ethical practices.

CO2: Analyze natural resource types and impacts, and propose sustainable development measures under conditions of environmental stress, using classification, availability data, and ecological considerations.

CO3: Identify major environmental issues and evaluate their effects at local to global levels, using scientific reasoning and assessing health, disaster, and ecological impacts.

CO4: Assess biodiversity threats, climate change effects, and conservation strategies in the face of global environmental challenges, considering traditional knowledge, legal frameworks, and international agreements.

Section A

Unit I. Humans and the Environment (3 Lectures)

Interaction between Human and Environment, Great ancient civilization and the environment, Indic knowledge and culture of sustainability, Industrial revolution and its impact on environment, Population growth and exploitation of natural resources.

Unit II: Natural Resources and Sustainable Development (5 Lectures)

Overview of natural resources: Definition of resources, Classification of natural resources.

Biotic resource: Major biotic resources, major biotic resources, microbes as a resource, status and challenges.

Water resource: Types of water resources, availability and use of resources, Environmental impact of overexploitation.

Soil and Mineral resource: Soil resource and its degradation, important mineral resource, Environmental problem due to mineral extraction.

Energy resource: Classification (Renewable & Non-renewable energy sources), important conventional & Non-conventional energy sources.

Section B

Unit III: Environmental Issues: Local, Regional and Global (3 lectures)

Environmental Issues and Scale: Concept of micro-, meso-, synoptic and planetary scale, Land Use and Land Cover Change, Land degradation, deforestation, desertification, urbanization, Ozone layer depletion.

Unit IV: Conservation of Biodiversity and Ecosystem (4 Lectures)

Biodiversity as a natural resource, Levels and types of biodiversity, Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories. Major conservation policies: in-situ and ex-situ conservation approaches; Major protected areas.

Section C

Unit V: Environmental Pollution and Health (3 Lectures)

Point and Non-point source of pollution, Source, type and adverse health impacts of air and water pollution, primary and secondary air pollutants, water quality parameters and standards , Sources of thermal and radioactive pollution and their impact on human health and ecosystem.

Unit VI: Climate Change: Impacts, Adaptation and Mitigation (4 Lectures)

Definition of climate change, anthropogenic factor for climate change, impact of climate change, Mitigation of climate change, carbon neutrality.

Section D

Unit VII: Environmental Management (3 Lectures)

Introduction of Environmental Management System (ISO: 14001), Environmental Impact Assessment, Waste Management and Concept of 3R (Reduce, Recycle, Reuse)

Unit VIII: Environmental Treaties and Legislation (5 Lectures)

Important Indian Environmental Legislation: The Wild Life Protection Act 1972,The Water (Prevention & Control of Pollution) Act 1974, The Air (Prevention & Control of Pollution) Act 1981, The Environmental Protection Act 1986.

Case Studies and Field Work

1. The students are expected to be engaged in some of the following or similar identified activities:
2. Discussion on one national and one international case study related to the environment and sustainable development.

3. Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.
4. Participation in plantation drives and nature camps.
5. Documentation of campus biodiversity.
6. Campus environmental management activities such as solid waste disposal, water Management and sanitation, and sewage treatment.

Text Books:

1. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
2. Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press.
3. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.
4. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, Weir Publisher (ELBS).
5. Adenle A., Azadi H., Arbiol J. (2015). Global assessment of technological innovation for climate change adaptation and mitigation in the developing world, Journal of Environmental Management, 161 (15): 261-275.
6. Jørgensen, Sven Marques, Erik João Carlos and Nielsen, Søren Nors (2016) Integrated Environmental Management, A transdisciplinary Approach. CRC Press.
7. UNEP (2007) Multilateral Environmental Agreement Negotiator's Handbook, University of Joensuu, ISBN 978-952-458-992-5
8. Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press.

Course Title/Code	**Professional English (**4.5ED03O001**)**
Course Type	**Core**
L-T-P Structure	**(1-0-2)**
Credits	**2**
Course Objective	To articulate communication skills and develop talent for increased understanding of corporate requirements.

Course Outcomes (COs)	
CO1	To enhance the knowledge of using grammar correctly.
CO2	To develop the ability for conveying ideas, emotions, and information through articulation.
CO3	To showcase the skills necessary for effective presentation with clarity in the professional life.
CO4	To exhibit the substantive writing skills.
Prerequisites (if any)	**Basic understanding of English Language & grammar**

Section – A

Grammar: Tenses, Sentence: Kinds & Parts, The Phrase, The Clause; Simple, Complex and Compound Sentences, Active & Passive Voices, Direct & Indirect Narration.

Section – B

Oral Communication: Importance of Speech Sounds, Organs of Speech, Vowel Sounds, Consonant Sounds, IPA Symbols, Phonetic Transcription, Stress & Intonation

Section – C

Communication & Self-Disclosure: Effective Self-Disclosure, Openness, Communication and Feedback for Self-Development, Perception & Attitudes, Values & Beliefs, Goal Setting, Career Planning, Self-Esteem, Managing Time, Rapid Reading, Taking Notes, Problem Solving, Creativity.

. **Section – D**

Technical Writing & Editing: Technical Writing, Editing- Technical Writing Process, Writing Drafts and Revising, Collaborative Writing, Creative Indexes, Technical Writing Style and Language. Introduction to Advanced Technical Communication, Usability, Hunan Factors, Managing Verbal & Non-Verbal Communication.

Lab Activities:

1. **Extempore**
2. **Comprehension**
3. **Essay**
4. **Paraphrasing**
5. **Telephonic Conversation**
6. **Sentence Analysis**
7. **Group Discussion**
8. **Organs of Speech**
9. **Phonetic Transcription**
10. **Job Application & CV**
11. **Draft Writing**
12. **Presentation**
13. **Mock Interview**
14. **Debate**

Suggested Text Book Reading:

CIEFL, Hyderabad. *Exercises in Spoken English Parts I-III*. Oxford University Press.
Gangal, J K. *A Practical Course for Developing Writing Skills in English*. PHI Learning Pvt.

Koneru, Aruna *Professional Communication*. Mcgraw Hills Education Pvt. Ltd.
Kumar, Sanjay and Pushpa Lata. Oxford University Press, 2011. Print.
Lyons, Liz Hamp and Ben Hearsly. Study Writing. Cambridge University Press. 2006. Print.
Pink, M.A. and A.C.

Thomas *English Grammar, Competition and Correspondence*. S. Chand and Co.

Rizvi, M Ashraf. *Effective Technical Communication*. McGraw Hill Education, Chennai, 2018.

Swan, Michael. *Practical English Usage*. OUP, 2014. Print.
Subhrmania, T. Bala. *A Textbook of English Phonetics for Indian Students*.: Macmillan.
Wood, F T. Remedial English Grammar. Macmillan, 2007. Print.
Wren and Martin: *High School English Grammar and Composition A Text Book for Indian Students*. S.Chand and Co. ed. Paperback 2018.

Zinsser, William. *On Writing Well*. Harper Resource Book, 2006. Print.

Course Title/ Code	**Fundamentals of Electrical and Electronics Engineering(4.5EC02O004)& (4.5EC02O104)**
Course Type	Core (Departmental)
Course Nature	Hard
L-T-P-O Structure	(3-0-2-0)
Credits	4
Objectives	This course covers fundamental electrical and electronics engineering principles, including circuit analysis, network theorems, AC/DC behavior, semiconductor devices, and sensor technologies, equipping students with essential knowledge and practical skills.

Course Outcome
CO1: Implement the fundamental concepts of Basic Electrical circuits.
CO2:Comprehend AC circuits, and gain basic knowledge of DC machines including stepper and servo motors**.**
CO3: Apply the concepts and working principles of Diodes for its various applications
CO4: Analyze the principles, types, and operation of various sensors and apply techniques for sensor data acquisition, processing, and interpretation.

	Sections	**Weightage**
Syllabus	A	25%
	B	25%
	C	25%
	D	25%
	TOTAL	**100%**

Fundamentals of Electrical and Electronics Engineering

CSE

Section-A: Basic Electrical Concepts

Basic Electrical Quantities: Voltage, current, power, energy. Ohm's Law: Resistance, conductance, and applications. Kirchhoff's Laws: DC Circuits-Series and Parallel Circuits, Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL). Mesh and Nodal Analysis. Network Theorems: Thevenin's and Norton's theorems, Superposition theorem. Capacitors and Inductors: Basic concepts, charging and discharging, time constants.

Section-B AC Circuits

AC Fundamentals: Sinusoidal waveforms, frequency, phase, RMS values. RL, RC circuits, Reactance and Impedance: Capacitive and inductive reactance, impedance in AC circuits- Power in AC Circuits: Real power, reactive power, apparent power, power factor. -Introduction to DC machines (DC Machine, Stepper Motor, servo Motor).

Section-C Semiconductor Devices

Diodes: Types, characteristics, and Diode as rectifier, Zener Diodes: Voltage regulation and applications Light Emitting Diodes: Characteristics, uses, and significance in electronics. Light Dependent Resistors: Properties and applications in light sensing. Transistors: Bipolar Junction Transistors (BJTs)-Characteristics-transistor as switch and amplifier.

Section-D Sensors in Electronics

Introduction to Sensors, Definition and Types, Principles of Operation, Temperature Sensors (Thermistor, RTD, Thermocouple), Motion Sensors (PIR, Ultrasonic sensor)- Environmental Sensors (Humidity, Gas sensor)- Data Acquisition and Processing: Techniques for sensor data acquisition, processing, and interpretation.

References

1. P. Prasad, Fundamentals of Electrical Engineering, PHI Learning Pvt. Ltd., 2014.
2. M. E. Van Valkenburg, Network Analysis, Prentice Hall, 1995.
3. K. S. Suresh Kumar, Electric Circuits and Networks, Pearson Education India, 2013.
4. B. S. Nair, Solid State Electronic Devices, Tata McGraw-Hill Education, 2011.
5. K. Lal Kishore, Electronic Devices and Circuits, Pearson Education India, 2011.
6. D. Patranabis, Sensors and Transducers, Prentice Hall, 2010.

Course Title/Code	**QUANTUM MECHANICS FOR ENGINEERS (**4.5PH02O001**)**
Course Type	Core
Course Nature	Hard
L-T-P Structure	3-0-0
Credits	03
Course Objectives	To equip students with a foundational understanding of quantum mechanics, and explore its connections for advancements in quantum computing.
Course Outcomes (COs)	
CO1	Understand fundamental phenomena like photoelectric effect and Compton effect that demonstrated particle nature of light. Explain how these observations led to the development of Quantum Mechanics.
CO2	Analyze systems in different potential fields using Schrödinger's wave equation.
CO3	Apply the abstract formalism of quantum mechanics to solve simple problems in quantum mechanics.
CO4	Understand the basics of quantum computing.

SYLLABUS:

Section A: Introduction to Quantum mechanics

Qualitative description of black body radiation; Photo-electric effect and Compton effect; Wave nature of matter: de Broglie hypothesis; Born interpretation; Normalized wave functions, Probability current; Phase and group velocity; Heisenberg's uncertainty principle and its applications; Time dependent Schrödinger equation; Time independent Schrödinger equation**(10 lectures)**

Section B: Applications of Schrödinger equation for stationary state solutions

Numerical solution of stationary state Schrödinger equation for different potentials: Free particle, Particle in a one-dimensional box (extension to three dimensions), One-dimensional harmonic oscillator potential, Particle in attractive delta function potential; Scattering from a

potential barrier and tunnelling: Related examples like alpha decay, Field ionization and Scanning tunnelling microscope.**(12 lectures)**

Section C: Abstract formalism of Quantum mechanics

Review of Young's double slit experiment; Linearity and superposition principle; Preliminaries of linear vector spaces; Postulates of quantum mechanics; Operators and observables; Eigen vectors and eigen values; Orthonormality and completeness; Dirac's bra and ket notation; Representation in discrete and continuous basis; Commutator algebra; Expectation values; Change of basis and unitary transformations.**(10 lectures)**

Section D: Introduction to Quantum computing

Conventional computing; Turing machine; Binary number systems; Classical logic gates; Moore's Law and the need for quantum computing; Qubits: Basis states and Superposition; Kronecker Product; Product states and Entanglement; Quantum logic gates; Reversibility of gates. **(12 lectures)**

Suggested Text Books

(i) Introduction to Quantum Mechanics, 2nd Ed. by David J. Griffiths, Cambridge India

(ii) Quantum Mechanics: Concepts And Applications, 2nd Ed. by Nouredine Zettili, Wiley India.

(iii) Concepts of Modern Physics, 6th Ed. By Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, Tata McGraw Hill India

CO – PO Mapping

Course Outcomes/ Statements	Program Outcomes (POs)										PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	3											
CO2	3	3											
CO3	3	2											
CO4	3	3											

Course Title/Code	**QUANTUM MECHANICS FOR ENGINEERS LAB (**4.5PH07O101**)**
Course Type	Core
Course Nature	Hard
L-T-P Structure	0-0-2
Credits	01
Course Objectives	To enable students to work collaboratively and communicate effectively in a scientific setting by designing and conducting experiments, analyzing data, and presenting findings.
Course Outcomes (COs)	
CO1	Students will be able to conduct experiments to investigate various scientific phenomena, analyze the resulting data, draw valid conclusions, and effectively communicate their findings, while collaborating effectively in a team.

SYLLABUS:

The following experiments need to be performed:

1. To determine the Planck's constant and work function of cathode material.
2. To determine the work function of cathode using Thyratron valve.
3. To determine the energy band gap of a PN junction diode.
4. To determine the Hall coefficient and hence carrier concentration of a material.
5. To study the variation of magnetic field along the axis of a current carrying coil and hence to estimate the radius of the coil.
6. To study the V-I characteristics of a solar cell hence to find the fill factor.
7. To determine the wavelength of laser light using plane transmission diffraction grating.
8. To find the ionization potential and to verify the quantization of energy values using Franck and Hertz Experiment.

Suggested reference books:

(i) Singh Harnam, Hemne P.S., B.Sc. Practical Physics, Publisher: S Chand & Company; New edition (2000)

(ii) C. S. Robinson, Dr. Ruby Das, A Textbook of Engineering Physics Practical, Publisher: Laxmi Publications Pvt. Ltd.; II edition (2016)

(iii) Practical Physics by S.L. Gupta and V. Kumar

CO – PO Mapping

Course Outcome	Program Outcomes (POs)											PSOs	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	-	-	-	3	-	-	-	1	1	-	-	-	-

Course Title/ Code	**WEB DESIGNING-I (**4.5CS07O101**)**
Course Type:	**CORE**
Course Nature:	Workshop
L-T-P-O Structure	(0-0-2-0)
Credits	1
Objectives	• To introduce students to scripting languages. • To teach students how to create simple web pages using HTML, how to use HTML tags, attributes and different types of HTML elements. • To teach students how to use inline CSS to style their web pages • To familiarize students with the Java script concept.

Course Outcome
CO1: Demonstrates the fundamentals of HTML,CSS and JavaScript to create web pages (Knowledge)
CO2: Design static web pages layouts with a good aesthetic sense of HTML and CSS structure and semantic components(Comprehension & Applications)
CO3: Develop interactive web pages using the JavaScript components (Application)
CO4: Apply the concepts to design websites/portfolios using HTML, CSS, and JavaScript for a real world problem majorly focused on SDGs (Application)

Section-A

INTRODUCTION TO SCRIPTING LANGUAGES: HTML, PHP, PERL, PYTHON etc…

Section-B

INTRODUCTORY CONCEPTS: What Is HTML5, Structure of a Web Page: HTML5 DOCTYPE, Page Encoding, HTML5 Markup, New And Updated Elements, Structural Elements(html, head, body, div, br, hr, p, text formatting, text styles, layouts, marquee, lists: ordered, unordered and definition lists,), New Attributes, Deprecated Elements And Attributes.
HTML 5.0 Form, Graphics & Media: HTML5 DOM, Form: new input types & attributes, form validation, HTML canvas and SVG: Drawing shapes, Text & images, working with pixels,

Embedding media**:** Audio and Video based On Plug-in, New Audio/Video Markup, Attributes and Methods, Audio/Video Events & Controls, Plug-ins in HTML inserting YouTube videos.

Section-C

CSS & CSS3: Introduction to CSS, Syntax, Selectors, Pseudo classes, Applying CSS to backgrounds, Text, Fonts, Links, Lists, Tables, Box Model: Border, Margin, Padding, Dimension, Display, Positioning, Align, CSS to Images and image Opacity, CSS Media Types, CSS Attr Selectors.
CSS3: Introduction**,** Rounded Corners, Border Images, Backgrounds, Colors, Gradients, Shadows, Fonts and text effects, 2D transforms, 3D Transforms, Transitions & Animations.

Section-D

JAVASCRIPT: JavaScript, Importance, What can JavaScript Do?, Need of JavaScript, JavaScript with HTML Content, Advantages of JavaScript; Attaching an External JavaScript File, Working with Data Types and Variables, operators and expressions; arrays. Functions in JavaScript: Creating & Calling Functions, Sending Parameters to a Function; condition checking, loops, If Structure, If Else Structure, For Loop, While Loop, dialogue boxes.

Mini project: Create a simple to-do list using JavaScript and Create a simple calculator using JavaScript.

List of labs:

1. HTML5.0 Basic Tags
2. HTML5.0: DOM & Forms
3. HTML5.0: Canvas &SVG
4. HTML5.0: Plugins
5. CSS
6. CSS
7. CSS
8. Javascript
9. Javascript
10. Javascript
11. Minor Project

Text Books:

1. Pro HTML5 and CSS3 Design Patterns Paperback – 2012 by Dionysios Synodinos, Michael Bowers, Victor Sumner
2. “Programming JavaScript Applications: Robust Web Architecture with Node, HTML5, and Moderns JS Libraries”
3. Dive into HTML5 by Mark Pilgrim.

Reference Book:

1. “JavaScript for Kids: A Playful Introduction to Programming” by Nick Morgan,.
2. HTML5 Guidelines for Web Developers by Klaus Förster.

Course Title/ Code	**COMPUTER AIDED DRAFTING(**4.5CD08O001)
Course Type:	**Core**
Course Nature:	**Workshop**
L-T-P Structure	**(0-0-2)**
Credit	**1**

Course Outcome	Mapping
CO1: Describe the fundamentals of engineering drawing and drafting and can Enhance visualization skill using projections of point and lines.	**Employability**
CO2: Students will be able to understand and perform the 2D drawing on AutoCAD.	**Employability/Skill**
CO3: Students will be able to apply different types of 2D commands of AutoCad and can prepare neat drawings.	**Employability/Skill**
CO4: Students will be able to apply different types of 3D commands of AutoCad.	**Employability/Skill**

Section-A

Introduction of Engineering Graphics: Drawing instruments and their uses, Orthographic Projections: Planes of projection–Projection of points in different quadrants. Orthographic Projection of Straight Line parallel to one plane and inclined to the other plane–Straight Line inclined to both the planes–True Length and inclination of lines with reference planes.

Section-B

Introduction: Introduction to Computer Aided Drafting (CAD), Reasons for implementing CAD, Applications of CAD, Benefits/limitations of CAD, Hardware of CAD system, Types of CAD software. Introduction to other drafting software such as Mechanical Desktop and Auto Cad Electrical Introduction to Auto CAD: Starting AutoCAD, AutoCAD screen components, creating a drawing on AutoCAD, invoking different commands, Dialog boxes, Coordinate Systems, Exercises on Drawing of Line, Circle, Arc, Ellipse, Polygon, etc.

Section-C

Drawing Aids and Editing Commands: Layers, Drafting Settings, Object Snaps, Function and Control keys, various Editing Commands, Editing the Objects with Grips, Grip Types. Creating Text, Dimensions and Tolerances in AutoCAD: Creating Text, Editing Text, Styles of Dimensioning, Dimensioning System Variables, Editing/Updating Dimensions, Adding Tolerances.

Section-D

Introduction to 3D modelling tools on AutoCad. 3D viewing techniques, working with simple and composite solids, Creating complex solids and surfaces, Modifying objects in 3D space, editing solids, creating 2D drawings from 3D models, working with the User Coordinate System.

Suggested Text/Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
(iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
(v) Corresponding set of CAD Software Theory and User Manual.

CO-PO Mapping

Course Outcomes	Program Outcomes												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	-	-	-	1	-	-	-	- -	-	-	3	2	-
CO2	-	-	-	-	2	-	-	-	2	-	-	3	2	-
CO3	-	-	-	-	3	-	-	-	-	-	1	3	2	-
CO4	-	-	-	-	3	-	-	-	-	1	1	3	2	-

Course Title Code	**Personal & Interpersonal Communication (4.5CD08O001)**
Course Type	Core
Course Nature	Soft
L-T-P Structure	(2-0-0)
Credits	1

Course Outcomes: The students will be able to:

CO 1: develop all-round personality by mastering interpersonal skills
CO 2: apply effective communication through grammatically correct language.
CO 3: demonstrate effective listening and speaking skills in real life scenarios.

Unit 1: **Attitudinal Communication**

1.1 Attitude and its Impact on Communication
1.2 Courtesy & Politeness in Communication
1.3 Diversity & Inclusion – Bullying, Cultural Sensitivity, Stereotypes, Sexual Harassment, LGBTQ, Respect, Chivalry, Racial & Gender Discrimination, Disability Harassment, Inclusion.

Unit 2**: Syntactical Communication - I**

2.1 Common errors in communication
2.2 Identification of word class
2.3 Errors & rectifications in
2.3.1 Article usage
2.3.2. Tenses usage - Present Perfect vs. Past Simple vs. Past Perfect
2.3.2 Subject Verb Agreement

Unit 3**: Phonetics**

3.1 Impact of First Language Influence
3.2 Tone
3.3 Intonation
3.4 Rate of Speech
3.5 Pronunciation: Vowels & Consonant sounds

Unit 4**: Developing Communication Skills -I (Listening & Speaking)**

4.1 Concept of LSRW: Importance of LSRW in communication.
4.2 Listening Skills : Real Life challenges, Barriers to Listening
4.3 Speaking : Self Introduction, Extempore

Recommended Texts and Readings:

1. Diversity and Inclusion: The Big Six Formula for Success by D.A. Abrams

2. Wren and Martin English Grammar and Composition, S. Chand & Company Pvt. Ltd.

3. Word Power Made Easy by Norman Lewis, Penguin Random House Pvt. Ltd.

4. Soft Skills for the Rigid Worker by Chris Estrada

5 . Mastering Soft Skills by Julian Vyner

Assessment Tools:

- Continuous Assessment: Assignments/ Activities/ Quiz
- Mid Term examination
- Term-end examination (Practical)

Internal Marks Distribution:

Mid Term examination	30 marks
Continuous assessment	20 marks

Course Articulation Matrix:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	3	3	2	2	-	-
CO2	-	-	-	-	-	-	-	-	-	3	2	2	-	-
CO3	-	-	-	-	-	-	-	-	2	3	2	2	-	-

Course Title/Code	**Data Modelling**(4.5CS05O002)	
Course Type	Core	
L-T-P Structure	1-0-0	
Credits	1	
Prerequisites	NA	
Course Objective	This course aims to provide a foundational understanding of data, its classification, storage mechanisms, and its role in Artificial Intelligence and Machine Learning.	
Course Outcomes (COs)		Mapping
CO1	Demonstrate an understanding of data sources, types, and their significance in the context of real-world applications.	Employability
CO2	Implement strategies for handling and processing each data type effectively.	Employability
CO3	Analyse the role of structured, unstructured, and semi-structured data in machine learning applications.	Employability/ Skill Development

SECTION-A

Data is everywhere, Different sources of data, Types of data, Data explosion, what has led to data explosion? Increase in Storage Capacities, Data Processing Abilities, Emerging Data Formats and Data Availability, of Data Explosion.

SECTION-B

Data Classification, Organization of structured data, Examples of structured data, How Structured Data expands? Advantages and Disadvantages of Structured Data, what is unstructured data? Examples of Unstructured Data, Advantages and Disadvantages of Unstructured Data, What is Semi-structured data?, Examples of semi-structured data, Advantages and disadvantages of semi-structured data, Comparison of structured, unstructured and semi-structured data.

SECTION-C

Data Storage - An Introduction, Mechanisms of data storage, Introduction to Databases, Database Architecture, Common Database Types, Tabular databases, Advantages and Limitations of tabular databases Entity Relationships and Tables, Characteristics of NoSQL databases, Types of NoSQL Datastores, Advantages and disadvantages of NoSQL, Know the history, How Big is Data? Sources of Data, Characteristics of Data

SECTION-D

Introduction and history of AI, Sources of Data, Introduction to AI, A Brief History of Data Science, Introduction to Machine Learning, History of AI, categories of ML systems, An Introduction to AI, ML and AI Overlap with Each Other? Applications of ML, Types of Data, Organization of Structured Data, Examples of Structured Data, Expansion of Structured Data, what is Semi-structured Data?

Textbooks: Reference Materials:

(i) **"Database Systems: The Complete Book"** – Hector Garcia-Molina, Jeffrey D. Ullman & Jennifer Widom

(ii) **"Unstructured Data Analytics"** – Jean Paul Isson & Jesse Harriott

Reference Books:

(i) **"Data Modeling Essentials"** – *Graeme Simsion & Graham Witt*

(ii) **"Data Modeling Made Simple"** – *Steve Hoberman*

CO-PO Mapping

Course Code	Course	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2
	DATA MODELING	CO1	2	1	-	-	-	-	-	-	-	-	-	3	2
		CO2	1	2	-	2	1	-	-	-	-	-	-	3	2
		CO3	3	1	1	3	-	-	-	-	1	1	-	3	2

Course Title/Code	**DATA MODELLING LAB (**4.5CS05O102)

Course Type	Core	
L-T-P Structure	0-0-2	
Credits	1	
Pre-requisites	NA	
Course Objective	This course aims to equip students with the ability to categorize and analyze various types of data—qualitative, quantitative, structured, semi-structured, and unstructured—while applying data modelling techniques to real-world scenarios.	
Course Outcomes (COs)		Mapping
CO1	To develop students' ability to categorize, model, and analyze diverse dataset using statistical techniques and data-driven decision-making approaches.	Skill Development

LIST OF EXPERIMENTS

- Identify data categorization by qualitative, quantitative and by ordinal, nominal, continuous and discrete.
- Feasibility of Opening a Food Chain in Tier-2 City.
- Model and analyse student academic performance data using Excel.
- Analyse structured, semi-structured and unstructured data.
- Data Modelling and Analysis in the Indian Premier League (IPL).
- Data Modelling for Performance Analysis in the Indian Premier League (IPL)
- Run Rate and Wicket Analysis in the IPL
- Analysing Dismissal Types in IPL Using Data Modelling
- Data Analysis in IPL Using Dataset
- Sales Data Analysis for a Retail Store

CO-PO Mapping

Course Code	Course	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	DATA MODELLING LAB	CO1	2	1	-	1	1	-	-	-	-	-	-	3	2

Course Title/Code	**Digital Transformation & Agile Development**(4.5CS05O003)

Course Type	Core	
L-T-P Structure	1-0-0	
Credits	1	
Prerequisites	NA	
Course Objective	To provide a comprehensive understanding of digital transformation, product management, agile methodologies, Scrum, and Kanban principles to enhance efficiency in modern business and software development environments.	
Course Outcomes (COs)		Mapping
CO1	Explain the concepts of digital transformation, design thinking, and their impact on modern business models.	Employability
CO2	Analyze product management strategies, agile methodologies, and their role in business and software development.	Employability
CO3	Apply Scrum and Kanban methodologies to improve workflow, project management, and software delivery efficiency.	Employability/ Skill Development

SECTION-A: Introduction to Digital Transformation

Introduction, Challenges of Traditional Business Model, Why Digital Transformation, Design Thinking, Different Phases of Design Thinking, Divergence, Emergence and Convergence of Design Thinking, Design Thinking vs. Agile vs. Lean, Agile Practices, Design Sprint and its Phases, Design Thinking vs Design Spirit.

SECTION-B:

Introduction to Product Management & Service Mindset, Product Manager, Building Products and services, Product lifecycle and phases, product development & Methodology; systems thinking, value chain, Introduction of Capability Optimization and Capability Maturity Model, Business Integration methods, Agile methodology, Product Marketing; User Experience Design

SECTION-C

Agile Methodology, Software, History of Software Engineering and Software, Development Methodologies, Traditional Software Development Models, Waterfall Model, Classical Waterfall Model, Traditional IT Organizations, Developers vs IT Operations Conflict, Birth of Agile, Four Values of the Agile Manifesto, Agile and Lean

SECTION-D

Scrum, Scrum Theory, Scrum Values, Scrum Roles, Scrum Master Scrum Sprints, Benefits of Scrum, Planning and Estimation, Agile Planning, Levels of Agile Planning, Conditions of Satisfaction, Velocity, Estimating Techniques, Soft Skills in Agile, Kanban Model.

SECTION-E

Kanban Principle, Kanban Board, Kanban Core Practices, Make work visible, Limit work in progress (WiP), Manage flow, Make progress policies explicit, Implement feedback mechanisms, Improve collaboratively (using methods and models)

Textbooks: Reference Materials:

(i) Digital Transformation: Survive and Thrive in an Era of Mass Extinction by Tom Siebel

(ii) Designed for Digital: How to Architect Your Business for Sustained Success by Jeanne Ross, Martin Mocker and Cynthia Beath

Reference Books:

(i) The Economics of Data, Analytics, and Digital Transformation by Bill Schmarzo

(ii) Driving Digital Strategy: A Guide to Reimagining Your Business by Sunil Gupta

CO-PO Mapping

Course Code	Course	Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
	Digital Transformation &Agile Development	CO1	2	1	-	-	-	-	-	-	-	-	2	2	2
		CO2	2	2	1	1	-	-	-	2	-	2	2	2	3
		CO3	2	2	1	1	2	-	-	-	-	2	2	2	3

Course Title/Code	Digital Transformation & Agile Development Lab(4.5CS05O103)
Course Type	Core

L-T-P Structure	0-0-2	
Credits	1	
Pre-requisities	NA	
Course Objective	To develop hands-on expertise in digital transformation methodologies, agile practices, Scrum, and Kanban through practical implementation and real-world case studies.	
Course Outcomes (COs)		Mapping
CO1	Implement agile methodologies, Scrum frameworks, and Kanban principles using industry-standard tools to optimize project workflows and product development.	Skill Development

LIST OF EXPERIMENTS

- Analyze a real-world business that has undergone digital transformation.
- Apply design thinking principles to solve a business challenge.
- Conduct a mini design sprint focusing on a specific problem.
- Map out the lifecycle of a chosen product and identify key phases.
- Implement an agile product development plan for a case study.
- Evaluate and improve the UX design of a given application.
- Develop a project plan using both Waterfall and Agile methodologies.
- Conduct a group activity to demonstrate Agile principles.
- Set up and manage a Scrum workflow using Jira or Trello.
- Conduct a sprint planning session and track progress.
- Create a Kanban board and implement work-in-progress (WiP) limits.
- Analyze an existing workflow and optimize it using Kanban principles.

CO-PO Mapping

Course Code	Course	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	Digital Transformation & Agile Development Lab	CO1	2	1	1	-	-	-	-	-	-	2	2	2	2

Course Title/ Code	**Fundamentals of Electrical and Electronics Engineering(4.5EC02O004)**
Course Type	MultiDisciplinary

L-T-P-O Structure	(3-0-0)
Credits	3
Objectives	This course covers fundamental electrical and electronics engineering principles, including circuit analysis, network theorems, AC/DC behavior, semiconductor devices, and sensor technologies, equipping students with essential knowledge and practical skills.

Course Outcome
CO1: Implement the fundamental concepts of Basic Electrical circuits.
CO2:Comprehend AC circuits, and gain basic knowledge of DC machines including stepper and servo motors**.**
CO3: Apply the concepts and working principles of Diodes for its various applications
CO4: Analyze the principles, types, and operation of various sensors and apply techniques for sensor data acquisition, processing, and interpretation.

Section-A: Basic Electrical Concepts

Basic Electrical Quantities: Voltage, current, power, energy. Ohm's Law: Resistance, conductance, and applications. Kirchhoff's Laws: DC Circuits-Series and Parallel Circuits, Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL). Mesh and Nodal Analysis. Network Theorems: Thevenin's and Norton's theorems, Superposition theorem. Capacitors and Inductors: Basic concepts, charging and discharging, time constants.

Section-B AC Circuits

AC Fundamentals: Sinusoidal waveforms, frequency, phase, RMS values. RL, RC circuits, Reactance and Impedance: Capacitive and inductive reactance, impedance in AC circuits- Power in AC Circuits: Real power, reactive power, apparent power, power factor. -Introduction to DC machines (DC Machine, Stepper Motor, servo Motor).

Section-C Semiconductor Devices

Diodes: Types, characteristics, and Diode as rectifier, Zener Diodes: Voltage regulation and applications Light Emitting Diodes: Characteristics, uses, and significance in electronics. Light Dependent Resistors: Properties and applications in light sensing. Transistors: Bipolar Junction Transistors (BJTs)-Characteristics-transistor as switch and amplifier.

Section-D Sensors in Electronics

Introduction to Sensors, Definition and Types, Principles of Operation, Temperature Sensors (Thermistor, RTD, Thermocouple), Motion Sensors (PIR, Ultrasonic sensor)- Environmental Sensors (Humidity, Gas sensor)- Data Acquisition and Processing: Techniques for sensor data acquisition, processing, and interpretation.

References

1. P. Prasad, Fundamentals of Electrical Engineering, PHI Learning Pvt. Ltd., 2014.
2. M. E. Van Valkenburg, Network Analysis, Prentice Hall, 1995.
3. K. S. Suresh Kumar, Electric Circuits and Networks, Pearson Education India, 2013.
4. B. S. Nair, Solid State Electronic Devices, Tata McGraw-Hill Education, 2011.
5. K. Lal Kishore, Electronic Devices and Circuits, Pearson Education India, 2011.
6. D. Patranabis, Sensors and Transducers, Prentice Hall, 2010.

Course Title/Code	**Python Programming (4.5CS04E007)**
Course Type	Core
L-T-P Structure	3-0-0

Credits	3
Prerequisites	NIL
Course Objective	Students can build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions.

CO	CO statement	Mapping
CO1	Demonstrate the installation of Python, and describe its fundamentals.	Employability& Skill development
CO2	To enable the student to demonstrate given program scenario and apply different programming constructs	Employability & Skill development
CO3	Implement data pre-processing using Python	Employability & Skill development
CO4	Analyse data using statistical modelling in Python	Employability & Skill development

Section- A Introduction

Introduction to Python, Development environment setup, Installing Python, Anaconda, Jupyter Notebook, Spyder, Components and Versions of Python, Difference between Python 2 and Python 3, Python Distributions Understanding the Python shell, writing a simple program, Concept of module and packages,
Basic Operators – Arithmetic, Relational, Assignment, Logical, Membership and Identity operators, Variables and Data Types, Understanding Mutable and Immutable types, Working with various type – None, Boolean(True/False), Numeric(int, float, long), Sequence(String, List & Tuple), Mapping(Dictionary) Understanding the concept of header & suites in the language construct, Conditionals and inline syntax, Multiple assignments in variables, Working with data type conversion, Working with Loops – While & For Effects of break, continue, pass & else statement in various construct.

Section- B Programming with Python

Implementing custom functions, Variable scope – Global vs. Local, dealing with various function arguments –, Understanding the concept of pass by value and pass by reference, Returning multiple values from a function, Anonymous & Recursive function, lambda functions
Understanding Strings in Python & different type of its delimiter, working with special string operators & formatted strings, exploring some useful built in string methods, Working with Date & Time,

Section-C Data Preprocessing

Introduction, Introduction to Pandas and Basic Concepts of Pandas, Data Cleaning and Preparation, Handling Missing Data, filtering out Missing Data, Filling in Missing Data, Data Transformation, Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, String Manipulation, Feature Engineering

Section-D Statistical Modelling

Derived Variables, Basic Exploratory Data Analysis, Methods for EDA and Examples, Statistical Modelling, Curve Fitting: Linear Regression, Nonlinear Regression

Text Books:

1. Dave Kuhlman, “A Python Book: Beginning Python, Advanced Python, and Python Exercises”, December 2013.

2. Mark Lutz’s, “Learning Python”, O’Reilly, 2001

Reference Books:

1. Sahana Kumaraswamy, Roy Antony Arnoid G, “Assignment for Object Oriented Programming using Python”, Infosys, Dec 2015.

2. Lutz, Mark, and Mark Lutz. Programming python. Vol. 8. O’Reilly, 1996. 3. Sommerville, “Software Engineering”, Addison Wesley, 1999.

Course Outcomes	**Program Outcomes**												**Program Specific Outcomes**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	3	2	2	2	2	2	1	1	1	2
CO2	-	-	-	3	3	2	2	2	2	2	1	1	1	2
CO3	3	3	-	-	1	-	-	-	2	2	1	1	1	2
CO4	3	3	-	3	-	2	-	-	2	3	1	1	1	2

Course Title/Code	**Python Programming Lab(4.5CS04E107)**
Course Type	Core
L-T-P Structure	0-0-2
Credits	2

Prerequisites	NIL
Course Objective	Students can build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions.

CO	CO statement	Mapping
CO1	Demonstrate the use of Python IDEs and apply programming constructs to implement basic functional programs.	Employability& Skill development
CO2	Implement data preprocessing techniques and perform statistical analysis using Python libraries.	Employability & Skill development

Python Programming Lab

List of Programs

1. Setting up the Python Environment using Anaconda IDE: Know Jupyter & Spyder
2. Write a program to perform Functions in Python
3. Write a program in Python First Class Functions & Immutable Data
4. Write a program in Python exploring String
5. Write a program in Python exploring Tuple
6. Work in Python using Collections
7. Write a program in Python to perform Dictionary
8. Write a program in Python to perform Sets
9. Write a program in Python to perform File Operation in Python
10. Write a program in Python to perform Data Preprocessing
11. Write a program in Python to perform Exploratory Data Analysis
12. Write a program in Python to actuate Curve Fitting.

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	–	–	–	3	3	2	2	2	2	2	1	1	1	2
CO2	3	3	–	3	3	2	–	–	2	2	1	1	1	2

Course Title	**Probability & Statistics (**4.5MA01E004**)**
Course Type	Core (Allied)

Course Nature	Hard
L-T-P structure	(3-1-0)
Credits	4
Objectives	Students would be able to understand and apply concepts of probability and statistics to solve related mathematical problems.

Course Outcome
CO1: Understand and apply fundamental concepts of probability, including probability spaces, conditional probability, and independence.(BT2)
CO2: Develop a comprehensive understanding of continuous probability distributions, including normal, exponential, and gamma, as well as bivariate distributions.(BT3)
CO3: Evaluate statistical parameters and measures of central tendency for binomial, Poisson, and normal distributions, and perform correlation and regression analysis.(BT3)
CO4: Conduct applied statistical analyses including curve fitting, and perform hypothesis testing for large and small samples using various tests like Chi-square for goodness of fit and independence. (BT4)

Section A

Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev s Inequality.

Section B

Continuous Probability Distributions: Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Bivariate Distributions: (Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes rule.

Section C

Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis Probability distributions: Binomial, Poisson and Normal evaluation of statistical parameters for these three distributions, Correlation and regression, Rank correlation.

Section D

Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Small samples:Test for single mean, difference of means and correlation coefficients, test for ratio of variances Chi-square test for goodness of fit and independence of attributes.

Textbooks/References:

1. S.P. Gupta and M.P. Gupta, Business Statistics, 14th ed., S. Chand & Sons., 2007
2. H. Arora, Probability and Statistics, 4th ed., S.K. Kataria & Sons., 2007

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

- **COURSE ARTICULATION MATRIX**

COURSE OUTCOME:	1	2	3	4	5	6	7	8	9	10	11	12
CO1 Understand and apply fundamental concepts of probability, including probability spaces, conditional probability, and independence.	**2**	**1**										
CO2 Develop a comprehensive understanding of continuous probability distributions, including normal, exponential, and gamma, as well as bivariate distributions.	**3**	**2**										
CO3 Evaluate statistical parameters and measures of central tendency for binomial, Poisson, and normal distributions, and perform correlation and regression analysis.	**3**	**2**										

CO4 Conduct applied statistical analyses including curve fitting, and perform hypothesis testing for large and small samples using various tests like Chi-square for goodness of fit and independence.	**2**	**2**										