MANAKULA VINAYAGAR
INSTITUTE OF TECHNOLOGY
An Autonomous Institution
Affiliated to Pondicherry University, Approved by AICTE, New Delhi,
Accredited by NAAC with 'A' Grade
Kalitheerthalkuppam, Puducherry- 605 107.

Curriculum & Syllabus for

UG Degree Course

in

B.Tech

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

R 2025

2025-26

S. No.	Category	AICTE	PU R-2023	MIT Proposed AI&ML R-2025
1.	Humanities and Social Sciences, including Management courses (HS)	**16**	**13**	**11**
2.	Basic Science courses(BS)	**23**	**24**	**19**
3.	Engineering Science courses including workshop, drawing, basics of electronics /electrical /mechanical /computer etc.(ES)	**29**	**26**	**26**
4.	Professional corecourses(PC)	**59**	**68**	**73**
5.	Professional Elective courses relevant to chosen Specialization/Branch(PE)	**12**	**12**	**12**
6.	Open subjects– Electives from other technical and /or emerging subjects(OE)	**09**	**09**	**09**
7.	Project work, seminar and internship in industry or elsewhere (CEC)	**15**	**17**	**14**
8.	EEC –Employability Enhancement Courses(EEC)	**-**	**-**	-
9.	Mandatory Courses(MCC) [Environmental Sciences, Induction Program, IndianConstitution, Essence of Indian Knowledge Tradition]	Non-credit	Non-credit	Non-credit
10.	Certification Courses(CCC)	Non-credit	Non-credit	Non-credit
	Total	**163**	**169**	**164**

SUMMARY OF ALL COURSES

S.No	Course Category	I	II	III	IV	V	VI	VII	VIII	Total Credits
1.	**HS**	2	3		3	3				**11**
2.	**BS**	4	8	3	4					**19**
3.	**ES**	13	10	3						**26**
4.	**PC**			19	16	19	12	7		**73**
5.	**PE**						6	3	3	**12**
6.	**OE**							3	6	**9**
7.	**CEC**				1		1	3	9	**14**
8.	**EEC**									
9.	**MCC***									
10.	**CCC***									
Total		**19**	**21**	**25**	**24**	**22**	**19**	**16**	**18**	**164**

SEMESTER I							
S.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
INDUCTION PROGRAMME							
THEORY							
1.	25UMAT11	Matrices and Calculus	BS	3	1	0	4
2.	25UECT12	Basic Electronics Engineering	ES	3	0	0	3
3.	25UHST13	Universal Human Values II	HS	2	0	0	2
4.	25UAIT14	Computational Thinking for AIML	ES	3	0	0	3
INTEGRATED COURSE							
5.	25UCSI16	Programming in C	ES	3	0	2	4
PRACTICAL							
6.	25UECP16	Basic Electronics Engineering lab	ES	0	0	2	1
7.	25UGEP17	Fabrication lab	ES	0	0	2	1
8.	25UAIP18	Design Thinking &Idea Lab for AIML	ES	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
9.	25UPCE11	Career Development Skills	EEC	0	0	2	0
MANDATORYCOURSE							
10.	25UMCC11	IKS – Concepts and applications in Engineering and Science	MCC	1	0	1	0
11.	25UMCC12	Holistic Wellness	MCC	0	0	2	0
Total							**19**

SEMESTER II							
S.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
THEORY							
1.	25UMAT21	Differential Equations & Transforms	BS	3	1	0	4
2.	25UAIT22	Python Programming	ES	3	0	0	3
3.	25UPHT23	Applied Physics for Computing Engineers	BS	3	0	0	3
INTEGRATED COURSE							
4.	25UAII24	Digital System Design for AIML	ES	3	0	2	4
5.	25UHSI25	Professional Communication for Engineers	HS	1	0	4	3
PRACTICAL							
6.	25UPHP27	Applied Physics Lab	BS	0	0	2	1
7.	25UAIP27	Python Programming Lab	ES	0	0	4	2
8.	25UGEP29	Engineering Graphics and Auto CAD	ES	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES							
9.	25UPCE21	Communication Skills	EEC	0	0	2	0
10.	25UCCC21	Certification Course I	CCC	0	0	0	0
MANDATORYCOURSE							
11.	25UMCC21	IKS in Humanities and Social Science	MCC	1	0	1	0
12.	25UMCC22	Environmental Science &Sustainability	MCC	0	0	2	0
Total							**21**

SEMESTER I

25UMAT11	MATRICES AND CALCULUS	Category	L	T	P	Credit
		BS	3	1	0	4

Course Prerequisite

- Higher Secondary Level Mathematics

Course Objective

- To understand and gain the knowledge of matrix algebra, partial differentiation, double integration, triple integration and their application, curl, divergence. To familiar with vector differential operators, integral theorems (Green's, Stoke's, Gauss divergence).

Course Outcome

On the successful completion of the course, students will be able to

CO1	Find eigenvalues and eigenvectors, verify the Cayley-Hamilton theorem, and perform orthogonal diagonalization.	Apply (K3)
CO2	Compute partial derivatives, determine total derivatives, Jacobians, employ Taylor's series, and find extremes of functions of two variables.	Apply (K3)
CO3	Demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume.	Apply (K3)
CO4	Compute gradients, divergence, curl, directional derivatives, and apply vector identities to solve vector field problems.	Apply (K3)
CO5	Apply Green's theorem, Stoke's theorem and Gauss divergence theorem.	Apply (K3)

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UNIT I MATRICES (12)

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

UNIT II FUNCTIONS OF SEVERAL VARIABLES (12)

Partial derivatives-Total derivative- Differentiation of implicit functions, Change of variables-Jacobians and their properties-Taylor's series for functions of two variables- Maxima and minima, Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS (12)

Multiple Integral – Change of order of integration (Cartesian form). Applications: Areas as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).

UNIT IV VECTOR DIFFERENTIATION (12)

Scalar and vector valued functions-gradient, tangent plane – directional derivative-divergence and curl- scalar and vector potentials. Statement of vector identities-simple problems.

UNIT V VECTOR INTEGRATION (12)

Line, surface and volume integrals- statements of Green's, Stoke's and Gauss Divergence theorems – verification and evaluation of vector integrals using them.

TOTAL PERIODS: 60

TEXT BOOKS

1.Veerarajan T., "Engineering Mathematics – I and II", Tata McGraw-Hill, New Delhi, 2014 and

2015.
2.Dr. M.K. Venkataraman, “Engineering Mathematics – Volume I and Volume II”, The National Publishing Company, Chennai 2008.

REFERENCE BOOKS

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., “A Text Book of Engineering Mathematics”, Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, Advanced Engineering Mathematics (9th Edition), John Wiley & Sons, New Delhi, 2011.

Online Courses/NPTEL/SWAYAM:

https://nptel.ac.in/courses/111106100

https://nptel.ac.in/courses/111104125

https://nptel.ac.in/courses/111105121

https://nptel.ac.in/courses/111107112

CO-PO -PSO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Problem based Assignment	Moodle / Google form	5
Simulation/ Projectbased assignment	Demo and viva	5
Attendance		5
Total		**40**

25UECT12	BASIC ELECTRONICS ENGINEERING	Category	L	T	P	Credit
		ES	3	0	0	3

Course Prerequisite:

- Basic knowledge about electronic circuits

Course Objective

- To learn the fundamental skills in the construction of electronics circuit design and develop various electronic systems.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the semiconductor physics of the intrinsic, p, and n materials.	Understand
CO2	Understand the function and operation of diodes, transistors and amplifiers.	Understand
CO3	Analyze the performance of BJT & FETs and its uses in amplifiers and oscillators.	Analyze
CO4	Analyze and design operational amplifier circuits.	Analyze
CO5	Understand the architecture, functions & their applications of IC 741 OP-Amp.	Understand

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UNIT I SEMI CONDUCTORS AND DIODES (9)

Conductors - Semiconductors - Intrinsic Semiconductors - Extrinsic Semiconductors. Diode Theory, Basic Ideas - ideal Diode - Forward and Reverse Bias - Diode Equation - Volt-Ampere Characteristic- Special diodes, symbol of zener diode - operation - V-I characteristics - symbol of photo diode - working principle - LED symbol and principle.

UNIT II RECTIFIERS (9)

Half-wave Rectifier - Full-wave and Bridge Rectifier - derivation of Ripple factor - efficiency of Half-wave -Full-wave and Bridge rectifiers, Merits and demerits of Half-wave - Full-wave and Bridge rectifiers - Comparisons of rectifiers.

UNIT III BIPOLAR JUNCTION &, FIELD-EFFECT TRANSISTORS(9)

Symbols of PNP and NPN transistors and their working principles -Transistor - Construction & working - Input and output characteristics of CB and CE configuration- Transistor as an Amplifier - Construction and working of JFET & MOSFET.

UNIT IV OSCILLATORS (9)

Principle of oscillation and Barkhausen criteria - LC oscillators: Hartley and Colpitts (operation and applications) - RC oscillators: Phase shift and Wien bridge (principle and working) - Crystal oscillator basics and applications-555 timer- Astable and Monostable Multivibrator

UNIT V OPERATIONAL AMPLIFIERS (9)

Characteristics of Op-Amps, Introduction to Op-amp - Op-amp Block Diagram - ideal and practical Op-Amps specifications - 741 Op-Amps & its features - Op-amp parameters &Measurement - Applications of Op-Amps: Inverting and Non-inverting amplifier - Integrator and differentiator - Comparators.

TOTAL PERIODS: 45

TEXTBOOKS:

1. Albert Malvino and David J Bates, "Electronic Principles", Tata McGraw–Hill, 9thEdition, 2021. (Unit 1 & 2)
2. Boyelstad, "Electronic Devices and Circuits Theory", Pearson Education, 11thEdition, 2013.(Unit 1, 2 & 3)
3. Morris Mano, "Digital design", PHI Learning, 4thEdition, 2016. (Unit 4)
4. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", PHI, 4thEdition, 2015. (Unit 5)
5. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International Pvt.Ltd., 5th Edition, 2018.(Unit 5)

REFERENCES:

1. Robert L.Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson/PHI, 10*th* Edition, 2010.
2. David A.Bell, "Electronic Devices and Circuits", Oxford, 5*th* Edition, 2009.
3. S.Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", TATA McGraw Hill, 2*nd* Edition, 2003.
4. David A, "Operational Amplifiers & Linear ICs", Oxford Uni. Press, 3*rd* Edition, 2005. (Unit 5)

ONLINE / NPTEL Courses:

1. Introduction to Basic Electronics: https://archive.nptel.ac.in/courses/122/106/122106025/
2. Basic Electronics: https://archive.nptel.ac.in/courses/108/101/108101091/

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Problem based Assignment	Moodle / Google form	5
Simulation (Python/Matlab/Scilab) Based Project assignment	Demo and viva	5
Attendance		5
Total		**40**

25UHST13	UNIVERSAL HUMAN VALUES II	Category	L	T	P	Credit
		HS	2	0	0	2

Course Objective:

• To highlight the plausible implications of such a holistic understanding in terms of ethical human conduct, trustful, mutually fulfilling human behaviour, and mutually enriching interaction with Nature.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand holistic vision of life.	Understand
CO2	Enhance socially responsible behavior.	Understand
CO3	Understand the responsibility of environmental work.	Understand
CO4	Understand the Competence and Capabilities for Maintaining Health and Hygiene.	Understand
CO5	Appreciate the aspiration for excellence (merit) and gratitude for all.	Understand

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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 Fulfil 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, Foundational Value in Relationship, Respect, Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

UNIT IV HARMONY IN THE NATURE/EXISTENCE (9)

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, Defining, Classifying, providingexamples or evidence, writing introduction and conclusion.

UNIT V IMPLICATIONS OF THE HOLISTIC UNDERSTANDING (9)

Natural Acceptance of Human Values, Definitive- ness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Hu- man 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 PERIODS: 45

TEXT BOOKS:

1. Premvir Kapoor, "Professional Ethics and Human Values", Khanna Book Publishing Company, New Delhi, 2022.
2. R RGaur,R Asthana, G P Bagaria, "The Textbook - A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2nd Revised Edition, 2019.
3. RR Gaur, R Asthana, G P Bagaria, "The Teacher's Manual- Teachers Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, 2019.

REFERENCES:

1. Annie Leonard, "The Story of Stuff", 2011.
2. A.N. Tripathi,"Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi, "The Story of My Experiments with Truth", FP classic, 2009.
4. A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, "VanVidya: EkParichaya", 1999.

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Case study analysis	Group discussion and report	5
Value-based project proposal	Presentation and peer evaluation	5
Attendance		5
Total		**40**

25UAIT14	COMPUTATIONAL THINKING FOR AIML	Category	L	T	P	Credit
		ES	3	0	0	3

Course Prerequisite

Higher Secondary Level Mathematics and General computer usage.

Course Objective

To develop computational thinking skills through understanding data, pattern recognition, algorithms, decomposition, abstraction, modeling, and complexity analysis in problem-solving and automation.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the key concepts of computational aspects of algorithm.	Understand
CO2	Understand the fundamental concepts of data analytics, visualization techniques and logical thinking.	Remember
CO3	Apply decomposition and algorithmic thinking for everyday tasks using various problem solving techniques.	Apply
CO4	Apply the concepts of abstraction and modeling to represent system tasks.	Apply
CO5	Analyze the efficiency of sorting and search algorithms and debug program errors.	Analyze

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UNIT I INTRODUCTION TO COMPUTATIONAL THINKING (9)

Understanding the concepts: Decomposition, pattern recognition / data representation, generalization / abstraction and Algorithms. Complexity, Modeling, Automation, Analysis, visualization.

UNIT II UNDERSTANDING DATA AND PATTERN RECOGNITION (9)

Performing analytics on numeric data using any spreadsheet software and visualizing the data using charts, histograms, scatter plots, graphs, Logical thinking – reasoning, Pattern recognition in data, data sequences, puzzles, nonograms. Data Encryption – ciphering sentences and Compression

UNIT III DECOMPOSITION AND ALGORITHMIC THINKING (9)

Decomposition, Algorithmic thinking – creating oral algorithms for everyday tasks – visualizing algorithms through sequence of steps, pseudocode, flow charts, selection, iteration, functions and procedures

UNIT IV ABSTRACTION AND MODELING: (9)

Abstraction and Modeling, Automata and Finite State Machine, Object Description, Objects and Objects based modeling – Repair, Reuse, Recycle.

UNIT V ETHICAL AI AND APPLIED COMPUTATIONAL THINKING: (9)

Ethical dimensions in AI – fairness, bias, data privacy, accountability, and responsible development of intelligent systems. Application of computational thinking in real-world scenarios – identification of problems, decomposition, abstraction, and algorithmic design-Case study

TOTAL PERIODS: 45

TEXT BOOKS:

1. Karl Beecher, Computational Thinking – A Beginner's Guide to Problem–Solving and Programming, BCS Learning, 2017.
2. Venkatesh G, Madhavan Mukund, Computational Thinking, Notion Press, 1st Edition, 2021.
3. A.DavidD.Riley,KennyA.Hunt, Computational Thinking for the Modern Problem Solver, CRC Press, 2015

REFERENCE BOOKS

1. David Clark, Computational and Algorithmic Thinking Book 2, AMT Publishing, 2016.
2. Paul Curzon, "Computing Without Computers: A Gentle Introduction to Computer Programming, Data Structures, and Algorithms", 2014.
3. Wang Paul S, From computing to computational thinking, CRC Press, 2016.
4. Peter J. Denning, Matti Tedre, Computational Thinking, MIT Press, 2019.
5. Paolo Ferragina, Fabrizio Luccio, Computational Thinking_ First Algorithms, Then Code, Springer International Publishing, 2018.
6. Aman Yadav, Ulf Berthelsen, Computational Thinking in Education_ A Pedagogical Perspective, Routledge, 2021.
7. Zhiwei Xu, Jialin Zhang, Computational Thinking_ A Perspective on Computer Science, Springer, 2021.

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Problem based Assignment	Moodle/Google form	5
Project based	Demo and viva	5
Attendance		5
Total		**40**

25UCSI16	PROGRAMMING IN C	Category	L	T	P	Credit
		ES	3	0	2	4

Course Prerequisite

- Basic programming skills.

Course Objective

- To impart the knowledge of basic programming constructs of C language, arrays and strings, functions,structures, pointers and input/output file handling.

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Demonstrate knowledge on C Programming constructs and develop simple program in C using basic constructs.	Understand (K2)
CO2	Apply arrays and string operations to solve basic problems using C	Apply (K3)
CO3	Develop modular programs using functions, recursion, and pointers	Apply (K3)
CO4	Implement user-defined data types using structures, unions, and manage memory dynamically.	Apply (K3)
CO5	Implement file operations and manage memory dynamically using pointers and preprocessor directives.	Apply (K3)

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UNIT I INTRODUCTION TO PROGRAMMING PARADIGMS: (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 – Compilation process.

UNIT II DECISION MAKING, ARRAYS AND STRINGS (9)

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 – typedef – Union – Storage classes and Visibility.

UNIT V FILE MANAGEMENT AND DYNAMIC MEMORY ALLOCATION:(9)

Files- Types of file processing, I/O Operations of File, Random access file, Command line arguments,Dynamic memory allocation – malloc, calloc, free, Preprocessor directive, Macro substitution, Compiler control directive.

TEXTBOOKS:

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. E. Balagurusamy, "Programming in C" McGraw-Hill, 8th Edition, 2019.
3. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", 8th edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press, 2013.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013

ONLINE/ NPTEL COURSES:

1. C for Everyone: Programming Fundamentals- https://www.coursera.org/learn/c-for-everyone
2. Art of C programming -https://onlinecourses.swayam2.ac.in/cec24_cs05/preview
3. Introduction to Programming in C.- https://onlinecourses.nptel.ac.in/noc22_cs40/preview

PRACTICE EXERCISES:

1. Study of Compilation and execution of simple C programs
2. Simple computational problems using arithmetic expressions (Arithmetic Operations, Area &circumference of a circle)
3. Problems involving if-then-else structures (ODD/EVEN numbers, Greatest Numbers)
4. Iterative problems e.g., sum of series (Factorial, Sum of Digits)
5. 1D and 2D, multi-dimensional arrays, traversal
6. Matrix problems, String operations (Addition, Subtraction, Multiplication, Palindrome StringOperations, String Handling Functions)
7. Simple functions (nCr Program, Swapping using call-by-reference)
8. Programming for solving Numerical methods problems (Palindrome Checking, Searching and Sorting Names)
9. Recursive functions (Factorial using Recursion)
10. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
11. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
12.Files: reading and writing, File pointers, file operations, random access, processor directives

CO-PO Mapping - PROGRAMMING IN C

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

Assessment Methodology	Assessment Tools	Marks
Theory Test		15
Coding assignments	Online submission	10
Mini project implementation	Code demo and documentation	10
Model Practical		10
Attendance		5
Total		**50**

25UECP16	BASIC ELECTRONICS ENGINEERING LAB	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite:
Nil

Course Objective:

- To design and analyze electronic circuits such as diodes, rectifiers, Zener diode, BJT, FET. To verify the basic logic operations and simple arithmetic circuits using logic gates.

Course Outcomes:
On the successful completion of the course, students will be able to

CO1	Understand the characteristics of basic electronic devices. Apply problem-solving skills, recognize and utilize the characteristics of diodes, rectifiers & transistors.	Apply
CO2	Interpret the Op-Amp-based inverting and non-inverting amplifier circuit.	Apply
CO3	Integrate diverse applications of Op-Amp in differentiator, integrator, adder & subtractor circuits.	Apply

LIST OF EXPERIMENTS

1. Measurement of different signal parameters using oscilloscope.
2. V-I characteristics of an ordinary p-n junction diode.
3. Full wave rectifier, with and without filter.
4. Half-wave rectifier and observe output waveform and measure ripple
5. Zener diode as a voltage regulator.
6. Input and output characteristics of BJT. (CE, CB)
7. Input and output characteristics of FET.
8. Op-Amp based inverting and non-inverting amplifier.
9. Op-Amp based differentiator and integrator.
10. Op-Amp based adder and subtractor.
11. 555 timer A stable and Monostable
12. RC phase shift oscillator

(Total Periods:45)

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
Circuit Construction Task	demo	5
Attendance		10
Total		60

25UGEP17	FABRICATION LABORATORY	Category	L	T	P	Credit
		ES	0	0	2	1

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Assemble and disassemble various items/equipment.	Understand
CO2	Make simple parts using suitable welding processes.	Apply
CO3	Set up wiring of distribution boards, machines, etc.	Apply
CO4	Utilize the electronic components to fabricate simple equipment, aided with sensors and actuators.	Apply
CO5	Take advantage of modern manufacturing practices	Apply

LIST OF EXPERIMENTS

(A). Dis-assembly & Assembly Practices

i) Tools and its handling techniques.

ii) Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.

iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.

iv. Dis-assembly and assembly of a Bicycle.

(B). Welding Practices

i. Welding Procedure, Selection & Safety Measures.

ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.

iii. Hands-on session of preparing base material & Joint groove for welding.

iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Stell plates/pipes, for fabrication of a simple part.

(C)Electrical Wiring Practices

i. Electrical Installation tools, equipment & safety measures.

ii.Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box,

iii.Hands-on session of electrical connections for Lighting, Fans, Calling Bells.

iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.

(D)Electronics Components / Equipment Practices

i. Electronic components, equipment & safety measures.

ii. Dis-assembly and assembly of Computers.

iii. Hands-on session of Soldering Practices in a Printed Circuit Breaker.

iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier.

v. Hands-on session of integration of sensors and actuators with a Microcontroller.

vi. Demonstration of Programmable Logic Control Circuit.

(E). Contemporary Systems

i. Demonstration of Solid Modelling of components.

ii. Demonstration of Assembly Modelling of components.

iii.Fabrication of simple components/parts using 3D Printers.

iv. Demonstration of cutting of wood/metal in different complex shapes using Laser Cutting Machine.

CO PO Mapping - FABRICATION LAB													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
1	3	3	3	2	3	2	-	1	1	-	3	1	2
2	3	3	3	2	3	2	-	1	1	-	3	1	2
3	3	3	3	2	3	2	-	1	1	-	3	1	2
4	3	3	3	2	3	2	-	2	1	-	3	1	2
5	3	3	3	2	3	2	-	3	1	3	3	1	2

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
PCB design and fabrication	Working prototype demo	5
3D Model contest	Review	5
Attendance		10
Total		60

25UAIP18	DESIGN THINKING AND IDEA LAB FOR AIML	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite

- Basic Knowledge of Science and interest in creative problem solving

Course Objective

- To introduce students to the principles, methodologies, and frameworks of design thinking for solving real-world problems.To cultivate user-centric, empathetic, and creative thinking through experiential learning and hands-on activities.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the fundamentals of design thinking, including its origin, process models, and tools.	Understand
CO2	Apply empathy tools and defining methods to understand user needs and formulate clear problem statements in design thinking.	Apply
CO3	Generate creative and innovative ideas using ideation techniques such as brainstorming, mind mapping, and lateral thinking.	Apply
CO4	Apply prototyping techniques to translate ideas into tangible models through iterative development of low-fidelity prototypes.	Apply
CO5	Interpret feedback from prototype testing and iteratively improve the design to better align with user needs.	Analyze

Syllabus

UNIT I FUNDAMENTALS OF DESIGN THINKING

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, the need of design thinking; An approach to design thinking**,** Design thinking Process model, Design thinking tools.

Case Studies: General, Engineering and Service applications

Activities: Identify Opportunity and Scope of the Project. Explore the possibilities and prepare a design brief

UNIT II: EMPATHIZE AND DEFINE

Design thinking phases, how to empathize, Role of empathy in design thinking, the purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools: Customer Journey Map, Personas.

Define- Methods of Define Phase: Storytelling, Critical items diagrams, Define success

Activities: Apply the methods of empathizing and Define Phases Finalize the problem statement

UNIT I IDEATION

Challenges in idea generation, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method**,** Create Thinking**,** Generating Design Ideas**,** Lateral Thinking**,** Analogies**,** Brainstorming**,** Mind mapping**,**

National Group Technique**,** Synectic's**,** Development of work**,** Analytical Thinking**,** Group Activities. Ideation Tools: How Might We? (HMW), Storyboard, Brainstorming. What is design innovation? A mindset for innovation**,** and asking "What if?" asking "What wows?" and "What works?"

Activities- Apply the methods of Ideate Phase: Generate Lots of Ideas

UNIT I V PROTOTYPING

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype.

Activities: Apply the Methods of the Prototype Phase: Create prototypes for selected ideas

UNIT V TING PROTOTYPES FOR AI

Prototyping for AI digital products: Design simple chatbot UI screens, Preparation; Prototyping for chatbot UI screens; Testing Prototypes with Users: Share the interactive prototype (chat UI) with a few users and ask feedback; Create a Pitch-Plan for scaling up-Road map for Implementation, Integrate chatbot into website or social media platforms, Fine-tuning and Submission of the project report

Activities: Collect feedback; iterate and improve ideas

Present your solution using the Digital Poster presentation.

TEXTBOOKS:

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
2. IdrisMootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc

REFERENCE BOOKS

1. Peter G. Rowe, Design Thinking: Understanding How Designers Think and Work, MIT Press, 1991.
2. Don Norman, The Design of Everyday Things, Basic Books, 2013.
3. Tom Kelley and David Kelley, Creative Confidence: Unleashing the Creative Potential Within Us All, Crown Business, 2013.
4. Todd Zaki Warfel, Prototyping: A Practitioner's Guide, Rosenfeld Media, 2009.
5. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, Engineering Design: A Project-Based Introduction, Wiley, 2011.
6. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development, McGraw-Hill Education, 2015.
7. Charles Platt, Make: Electronics: Learning Through Discovery, Maker Media, 2011.

CO-PO Mapping

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

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
RPA and BOT Building		20
Virtual lab assignment	Review	10
Attendance		10
Total		**60**

25UPCE11	CAREER DEVELOPMENT SKILLS	Category	L	T	P	Credit
		EEC	0	0	2	0

Prerequisite: Basic communication skills and foundational knowledge of workplace behaviour.

Course Objective

To empower students with the skills for self-discovery, goal achievement, effective time management, and personal effectiveness, alongside foundational knowledge in career planning, emotional intelligence, higher education, competitive exams, and entrepreneurship

Course Outcome

On the successful completion of the course, the students will be able to

CO1	Help students assess themselves, explore career options, and set actionable goals through structured planning.
CO2	Develop motivation, enhance personality effectiveness, and instill discipline for personal and professional growth.
CO3	Build awareness and practice of grooming, hygiene, positive attitudes, manners, and professional behavior.
CO4	Strengthen self-awareness, time and stress management, and emotional intelligence for balanced personal development.
CO5	Introduce students to higher education paths, competitive exams, and the fundamentals of entrepreneurship and business planning

SYLLABUS

UNIT 1 **6 Hrs**

Career Planning: Introduction to Career Planning - Self-Assessment for Career Planning - Exploring Career Options- Developing a Career Plan;

Goal Settings: Understanding Goal Setting - Setting Effective Goals - Action Plan Development - Practical Exercises

UNIT 2 **6 Hrs**

Motivation – I: Definition and Importance of Motivation - Types of Motivation - Theories of Motivation - Factors Affecting Motivation

Personality Effectiveness: Components of Personality Effectiveness - Communication Skills - /Interpersonal Skills - Practical Exercises

Building Personality and Discipline: Introduction to Personality Development - Building Positive Habits - Discipline and Self-Control - Practical Application

UNIT 3 **6 Hrs**

Grooming, hygiene and Cleanliness: Personal Hygiene Practices - Body Grooming Techniques - Environmental Cleanliness - Mental and Social Impact of Grooming and Hygiene.

Attitudes, Manners and Behaviour: Understanding Attitudes - Developing Positive Attitudes - Manners and Etiquette - Procedures and Protocols

UNIT 4 **6 Hrs**

Self- Awareness & Self Confidence: Introduction to Self-Awareness- Understanding Strengths and Weaknesses- Building Self-Confidence- Practical Application

Time Management:Introduction to Time Management - Planning and Prioritizing Tasks- Overcoming Procrastination- Practical Time Management

Stress Management: Understanding Stress- Stress Management Techniques-Coping Strategies- Practical Application

Emotional Intelligence:Introduction to Emotional Intelligence- Managing Emotions- Social Awareness and Relationship Management-Practical Exercises

UNIT 5 **6 Hrs**

Introduction to Higher Education, Competitive exams:Overview of Higher Education- Competitive Exams Overview - Exam Preparation Techniques

Introduction to Entrepreneurship: Understanding Entrepreneurship- Developing a Business Idea - Business Planning.

Text Book

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
   Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education

Reference Book

1. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.
2. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Mapping with Programme Outcomes

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

25UMCC11	IKS – CONCEPTS AND APPLICATIONS IN ENGINEERING AND SCIENCE	Category	L	T	P	Credit
		MCC	0	0	2	0

Course Prerequisite

- Basic understanding of science and engineering fundamentals

Course Objective

- Familiarize students with traditional Indian knowledge systems and their scientific
- foundations
- Explore the integration of ancient wisdom with modern engineering practices
- Understand sustainable technologies and innovations rooted in Indian traditions
- Develop appreciation for indigenous knowledge in solving contemporary challenges
- Foster research mindset towards validating and modernizing traditional practices

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the historical development and scientific basis of Indian Knowledge Systems	Understand
CO2	Analyze traditional Indian practices in mathematics, astronomy, metallurgy, andmedicine	Analyze
CO3	Apply IKS principles to contemporary engineering and scientific problems	Apply
CO4	Evaluate the sustainability aspects of traditional Indian technologies	Evaluate
CO5	Create innovative solutions by integrating traditional knowledge with modernscience	Create

Syllabus

UNIT I INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS

Historical overview of Indian Knowledge Systems - Scientific methodology in ancient India - Major texts and scholars: Vedas, Upanishads, Charaka Samhita, Sushruta Samhita - Transmission and preservation of knowledge - Contemporary relevance and global recognition.

UNIT II: MATHEMATICS AND ASTRONOMY IN ANCIENT INDIA

Indian contributions to mathematics: Zero, decimal system, trigonometry - Aryabhata, Brahmagupta, Bhaskara's contributions - Astronomical observations and calendar systems - Navigation techniques and geographical knowledge - Applications in modern engineering calculations.

UNIT III: METALLURGY, MATERIALS, AND ARCHITECTURE

Ancient Indian metallurgy: Iron pillar of Delhi, Wootz steel - Traditional building materials and techniques -Architectural marvels: Structural engineering principles - Water harvesting and management systems - Sustainable construction practices.

UNIT IV: RENEWABLE ENERGY AND CLIMATE CHANGE

Ayurveda: Principles and scientific validation - Traditional agricultural practices and crop management – Biodiversity conservation methods - Food preservation techniques - Biotechnology applications in traditional practices.

UNIT V: INTEGRATION WITH MODERN SCIENCE AND TECHNOLOGY

Validating traditional knowledge through modern scientific methods - Case studies of successful IKS-modern science integration - Intellectual property and traditional knowledge protection - Research opportunities and career prospects - Future directions and challenges

TEXTBOOKS:

1. Subhash Kak, “The Nature of Physical Reality”, Mount Meru Publishing, 2016
2. B.V. Subbarayappa, “Indian Astronomy: A Source Book”, Nehru Centre, 2008
3. Kapila Vatsyayan, “Traditional Indian Art and Culture”, Cambridge University Press, 2015

REFERENCE BOOKS & WEB RESOURCES

1. P.P. Divakaran, “The Mathematics of India: Concepts, Methods, Connections”,Springer, 2018
2. S.N. Sen, “Ancient Indian History and Civilization”, New Age International, 2010
3. National Mission for Manuscripts - www.namami.gov.in
4. Digital Library of Traditional Ecological Knowledge - www.frlht.org
5. CSIR Traditional Knowledge Digital Library - www.tkdl.res.in

CO PO Mapping

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

25UMCC12	HOLISTIC WELLNESS	Category	L	T	P	Credit
		MCC	0	0	2	0

Course Prerequisite

- Nil

Course Objective

- Foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and Internal well-being. create a balanced lifestyle that promotes overall health and happiness through practical activities.
- Explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the basic principles of holistic wellness. Apply strategies for maintaining physical health, including nutrition and exercise	Understand
CO2	Practice mindfulness techniques to enhance mental and emotional well-being.	Analyze
CO3	Develop a personal wellness plan incorporating various aspects of holistic health.	Apply
CO4	Apply advanced techniques in mindfulness, meditation, and stress management.	Evaluate
CO5	develop resilience and adaptability in maintaining wellness. Refine and sustain a personalized holistic wellness plan.	Create

Syllabus

UNIT I INTRODUCTION TO HOLISTIC AND PHYSICAL WELLNESS

Overview of holistic wellness: physical, mental, emotional, and internal health- The importance of balance in overall well-being. Importance of physical activity and exercise- Understanding nutrition and its role in health- Sleep hygiene and its impact on well-being.

Hands-on activity: Self-assessment of current wellness status.Designing a personalized fitness and nutrition plan.

UNIT II: MENTAL AND EMOTIONAL WELLNESS:

Stress management techniques- The role of Yoga, mindfulness and meditation in mental health- Emotional intelligence and its impact on relationships.

Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises.

UNIT III: INTEGRATING WELLNESS PRACTICES:

Combining physical, mental, emotional, and Internal wellness practices into daily life - Developing a balanced wellness plan.

Hands-on activity: Creating a comprehensive personal wellness plan.

UNIT IV: EMOTIONAL RESILIENCEAND ADVANCED MINDFULNESS

Deepening mindfulness practices for enhanced mental clarity- Exploring different forms of meditation (e.g., guided, transcendental, movement-based). Building emotional resilience through positive psychology practices- Cognitive-behavioural strategies for managing stress and anxiety.

Hands-on activity: Developing and practicing a resilience toolkit. Daily meditation practice and journaling reflections.

UNIT V: INTERNAL GROWTH AND SUSTAINING WELLNESS PRACTICES:

Exploring the deeper aspects of internal wellness and self-actualization- Reflective practices for discovering life purpose and meaning. Strategies for maintaining wellness habits over the long term- Adapting wellness plans to life changes and challenges-

Hands-on activity: Revising and finalizing a long-term personal wellness plan. Creating a vision board or personal mission statement.

TEXTBOOKS:

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

REFERENCE BOOKS

1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)
2.Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3.James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4.Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
5.KalderdonAdizesIchak., What Matters in Life: Lessons I Learned from Opening My Heart
., WS Press, Newtown, PA (2023)
6. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
7. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).

WEB RESOURCES

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

CO PO Mapping

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

SEMESTER II

25UMAT21	DIFFERENTIAL EQUATIONS & TRANSFORMS	Category	L	T	P	Credit
		BS	3	1	0	4

Course Prerequisite-

- Engineering Mathematics-I

Course Objective

- To introduce mathematical tools to solve first order differentiation equations.
- To gain knowledge of problem-solving techniques of PDE.
- To understand concept of the Laplace transform.
- To inculcate the computation knowledge in Laplace transforms.
- To acquaint with Fourier Transform techniques used in a wide variety of situations involving functions that are not necessarily periodic.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Solve higher order differential equations	Apply
CO2	Formulate and solve various types of partial differential equations	Apply
CO3	Apply Laplace transforms and initial and final value theorems to solve engineering problems involving step, impulse and periodic functions.	Apply
CO4	Apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations	Apply
CO5	Apply Fourier transform techniques, including Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity	Apply

SYLLABUS

UNIT I ORDINARY DIFFERENTIAL EQUATIONS (12)

Differential Equations (Higher order): Linear differential equations of higher order – with constant coefficients, the operator D, Euler 's linear equation of higher order with variable coefficients - simultaneous linear differential equations, solution by variation of parameters method.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS (12)

Formation of partial differential equations- Solutions of standard types of first order partial differential equations- Lagrange's linear equation- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT III LAPLACE TRANSFORM (12)

Existence conditions-Transforms of elementary functions- Properties, Transform of unit step function and unit impulse function -Transforms of derivatives and integrals- Transforms of Periodic Functions- Initial and final value theorems.

UNIT IV INVERSE LAPLACE TRANSFORM (12)

Inverse Laplace Transforms – Properties, Convolution theorem, Application - Solution of ordinary differential equations with constant coefficients -Solution of simultaneous ordinary differential equations.

UNIT V FOURIER TRANSFORM (12)

Fourier Integral theorem (statement only), Fourier transform and its inverse – Properties, Fourier sine and cosine transform - Properties, Convolution and Parseval's identity.

TOTAL PERIODS:60

TEXTBOOKS:

1. Veerarajan T., "Engineering Mathematics – I and II",Tata McGraw-Hill, New Delhi, 2014 and 2015.
2. Dr. M.K. Venkataraman, "Engineering Mathematics – Volume I and Volume II", The National Publishing Company, Chennai 2008.

REFERENCE BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9th Edition, 2011.

ONLINE COURSES/NPTEL/SWAYAM:

1. https://nptel.ac.in/courses/111106139
2. https://nptel.ac.in/courses/111101153
3. https://nptel.ac.in/courses/111107119

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Mathematical modeling assignment	Analytical solution presentation	5
Transform applications project	Demo and viva	5
Attendance		5
Total		**40**

25UAIT22	PYTHON PROGRAMMING	Category	L	T	P	Credit
		ES	3	0	0	3

Course Prerequisite:

- Programming in C

Course Objective:

- To impart the knowledge of Python basic structure, components, object storage, exception handling, and graphics toolkit using Tinker.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand Python's basic syntax, data types, and control statements, and apply built-in functions for manipulating numbers and text.	Understand
CO2	Analyze and use Python operators, collections, and file handling concepts, and evaluate type conversions and assignments for effective programming.	Analyze
CO3	**Understand** object-oriented concepts, **develop** functions, classes, and modules, and **analyze** inheritance and advanced function calling techniques.	Apply
CO4	**Understand** exception handling mechanisms, **develop** robust file I/O operations, and **analyze** methods to control file paths and errors.	Apply
CO5	**Understand** GUI programming fundamentals, **develop** interactive applications using Tkinter and Turtle graphics, and **analyze** the use of widgets and dialog boxes.	Apply

SYLLABUS

UNIT I INTRODUCTION(9)

History of python - Features of Python - Basic syntax: Indentations, comments - Statement and expressions - Python Identifiers and keywords – variables - Datatypes: int, complex, float, Boolean, string - String slicing - String built in function - Operator basics.

UNIT II CONTROL STATEMENT (9)

Control statements: if - if-else - if-elif-else – while – for – break – continue - pass. List – tuple - set and dictionary - Type conversion: Implicit and explicit(Type casting)

UNIT III FUNCTIONS AND PACKAGES (9)

Functions in python - parameters and arguments - return type - Global and local scope - Lambda functions - Built in functions - recursive function. Modules - Importing Modules - Packages and Interface - creating a module

UNIT IV OOPS AND EXCEPTION HANDLING (9)

Class and object: creating class, creating class methods, Inheritance, Abstraction and Excapsulation, Method overloading, Exceptional handling, Built-in exceptions.

UNIT V FILES AND GUI PROGRAMMING (9)

Files, File operations, reading a file content, writing a file, modifying files pos, controlling file I/O, Manipulating file paths. GUI Programming toolkits – Introduction to Tkinter – Creating GUI widgets – Resizing – Configuring widget options – Creating Layouts – Radio buttons – Check boxes – Dialog boxes – Drawing using Turtle

TOTAL PERIODS: 45

TEXTBOOKS:

1. Martin C. Brown, "The Complete Reference - Python", Tata McGraw Hill Indian Edition, 2010. (UNIT 1-4)
2. Alan D. Moore Python GUI programming with Tkinter: Design and build functional and user-friendly GUI applications,2021. (Unit-5)

REFERENCES

1. Wesley J Chun, -Core Python Applications Programming, Prentice Hall, 2012.
2. Eric Matthes, "A Hands-On, Project-Based Introduction to Programming", 2nd Edition,2019.

ONLINE/ NPTEL COURSES:

1. Programming, Data Structures and Algorithms using Python https://nptel.ac.in/courses/106106145
2. The Joy of Computing using Python- https://nptel.ac.in/courses/106106182
3. Python for Data Science- https://nptel.ac.in/courses/106106212

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Coding assignments	Online submission	5
Mini project implementation	Code demo and documentation	5
Attendance		5
Total		**40**

25UPHT23	APPLIED PHYSICS FOR COMPUTING ENGINEERS	Category	L	T	P	Credit
		BS	3	0	0	3

Course Prerequisite

- **Solid-state physics basics, Atomic models and bonding,**Semiconductor theory.

Course Objective:

- To make the students understand the importance in studying electrical properties of materials, semiconductor physics, wave function in quantum mechanics and its practical application in technologies. To inculcate an idea of the significance of nanostructures, quantum confinement, ensuing nano device applications and quantum computing.

Course Outcome

On the successful completion of the course, students will be able to

CO1	**Relate** how electrons work inside solid materials and why different materials have different electrical properties - from metals that conduct well to insulators that don't conduct at all, with semiconductors falling in between	Understand K2
CO2	**Understand** how pure and doped semiconductors work, including their energy structures, carrier behavior, and how electrons and holes move through them under electric fields and concentration gradients.	Understand K2
CO3	**Understand** and explain the properties of matter waves andparticle in a one-dimensional infinite potential well **,**quantization of energy levels.	Understand K2
CO4	**Understand the** basic mechanisms of light absorption, emission, and scatteringin various materials **.**Explore the function of photo detectors**,** and their application in light sensing technologies**.**	Understand K2
CO5	**Understand** classical bits and quantum bits (qubits)**,** and understand theirrepresentation using quantum states**.** Apply basic quantum logic gates**, such** as theCNOT gate**,** and explore multi-qubit operations**.**	Understand K2

SYLLABUS

UNIT IELECTRICAL PROPERTIES OF MATERIALS (9)

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS (9)

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in Ntype& P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III QUANTUM PHYSICS (9)

De Broglie hypothesis of matter waves; properties of matter wave; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non existence of electron in nucleus; Schrodinger ‘s time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well, – tunneling (qualitative) - scanning tunneling microscope, Quantum Computing.

UNIT IV OPTICAL PROPERTIES OF MATERIALS (9)

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANODEVICES AND QUANTUM COMPUTING (9)

Introduction - quantum confinement– quantum structures:quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade-resonant-tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits – CNOT gate -multiple qubits – Bloch sphere –quantum gates – advantage of quantum computing over classical computing

TOTAL PERIODS: 45

TEXTBOOKS

1. Umesh K Mishra & Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
2. Wahab, M.A. “Solid State Physics: Structure and Properties of Materials”. Narosa Publishing House, 2009.
3. Kasap, S.O. “Principles of Electronic Materials and Devices”, McGraw-Hill Education, 2007
4. Bhattacharya, D.K. & Poonam, T. ―Engineering Physics‖. Oxford University Press, 2015.
5. Jasprit Singh, ―Semiconductor Devices: Basic Principles, Wiley 2012.
6. Garcia, N. & Damask, A. ―Physics for Computer Science Students‖. Springer-Verlag, 2012

REFERENCES

1. Charles Kittel, Introduction to Solid State Physics, WileyIndiaEdition,2019.
2. Y.B.Band and Y. Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
3. V.V. Mitin, V.A.Kochelap and M.A.Stroscio ,Introduction to Nanoelectronics, Cambridge Univ. Press, 2008.
4. G.W.Hanson, Fundamentals of Nano electronics, Pearson Education (Indian Edition) 2009

CO-PO Mapping											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	3	-	-	2	-	-	-	-	2
CO2	3	3	3	-	-	2	-	-	-	-	2
CO3	3	3	3	-	-	2	-	-	-	-	2
CO4	3	3	3	-	-	2	-	-	-	-	2
CO5	3	3	3	-	-	2	-	-	-	-	2

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
MCQ unit wise 10 questions	Moodle / Google form	5
Virtual lab based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UAII24	DIGITAL SYSTEM DESIGN FOR AIML	Category	L	T	P	Credit
		ES	3	0	2	4

Course Prerequisite

- Basic Programming Knowledge

Course Objective

- To design combinational logic circuits and Sequential logic circuits, including multiplexers, decoders, encoders, adders, subtractors, flip-flops and Latches. To learn the basics of IoT devices and types of boards.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the application of number representation and basic codes.	Understand
CO2	Understand Boolean algebra and its foundational theorems and use of the Karnaugh map simplification.	Understand
CO3	Design and analyse Combinational Logic Design and Programmable Logic Devices.	Analyse
CO4	Design and construct Combinational Logic circuits and Synchronous Sequential Circuits.	Analyse
CO5	Design and implement combinational logic circuits using PROM, PLA, and PAL	Apply

SYLLABUS

UNIT-I BASIC CONCEPTS (9)

Number System: Binary Number Representations – Signed Numbers and Complements, Unsigned, Fixed Point, and Floating-Point numbers. Addition and subtraction with 1‘s and 2‘s complements. Codes for detecting and correcting errors: Even and Odd parity codes

UNIT-II BOOLEAN ALGEBRA (9)

Boolean Algebra: Basic theorems- Postulates- Duality – Boolean Function- Canonical form- Standard form. Simplification of Boolean Function: Karnaugh Map Method. Basic Theorems - Simplification of K-map functions.

UNIT – III COMBINATIONAL LOGIC DESIGN (9)

Combinational Logic Design: Half adder - Full adder– Parallel Adder- Carry Look Ahead Adder – BCD Adder – Magnitude Comparator – Encoders and Decoders – Multiplexers – Code converters – Parity generator, Parity checker.

UNIT – IV SEQUENTIAL CIRCUITS (9)

Sequential Circuits: General model of sequential circuits –latches – Master-slave Configuration- Flip-Flops - Concept of State – State diagram – State Table. Design of Synchronous counters- Asynchronous counters- Shift Register- PN Sequence generator.

UNIT – VPROGRAMMABLE LOGIC DEVICES (9)

Programmable Logic Devices: PROM – EPROM – EEPROM- Programmable Logic Array (PLA) – Programmable Array Logic (PAL) -Realization of combinational circuits using PROM, PLA, and PAL.

TOTAL PERIODS: 45

TEXTBOOK(S)

1. M. Morris Mano and Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL and System Verilog, 2018, 6th Edition, Pearson Pvt. Ltd.

REFERENCE BOOKS

1. Ming-Bo Lin, Digital Systems Design and Practice: Using Verilog HDL and FPGAs, 2015, 2nd Edition, Create Space Independent Publishing Platform.
2. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, 2009, 2nd edition, Prentice Hall of India Pvt. Ltd.
3. Stephen Brown and Zvonko Vranesic, Fundamentals of Digital Logic with Verilog Design, 2013, 3rd Edition, McGraw-Hill Higher Education.

ONLINE/ NPTEL COURSES:

1. Digital Circuits: https://onlinecourses.nptel.ac.in/noc23 ee115
2. Digital Circuits Design: https://onlinecourses.nptel.ac.in/noc22 ee110
3. Microelectronics: Devices to Circuits: https://nptel.ac.in/courses/108107142

Mapping with Program Outcomes											
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
1	3	3	2	-	-	-	-	-	-	-	2
2	3	3	3	2	-	-	-	-	-	-	2
3	3	3	3	2	2	-	-	-	-	-	2
4	3	3	3	2	2	-	-	-	-	-	2
5	3	2	3	-	2	-	-	-	-	-	2

LIST OF EXPERIMENTS

1. Study Of Logic Gates
2. A) Design and Implementation of Adder
   B) Design And Implementation of Subtractor
3. Design And Implementation of Binary to Gray Code and Gray to Binary.
4. Design And Implementation Of 4-Bit Binary Adder/ Subtractor and BCD Adder Using IC7483
4. Design And Implementation 4-Bit Magnitude Comparator Using Logic Gates.
5. Design And Implementation of 4:1 Multiplexer Using Logic Gates.
6. Design And Implementation of Priority Encoder.
7. Study Of Flip-Flops Using Gates

8 Design and Implementation of Ring Counter and Johnson Counter Using a Shift Register IC.

9. Design And Implementation 3-Bit Binary Up/Down Counter Using ICs.
10. Simulation Of Combinational Circuits Using LTspice Tools.
11. Design And Implementation Of 4-Bit Adder-Subtractor and BCD Adder Using IC7483

Assessment Methodology	**Assessment Tools**	**Marks**
Theory Test		15
Logic design project	Hardware implementation	10
Digital system simulation (TINKERCAD)	Demo and viva	10
Model Practical		10
Attendance		5
Total		**50**

25UHSI25	PROFESSIONAL COMMUNICATION FOR ENGINEERS	Category	L	T	P	Credit
		HS	1	0	4	3

Course Prerequisite:

- Basics of English Language

Course Objective:

- To improve the communicative competence of learners
- To learn to use basic grammatic structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

Course Outcome

On the successful completion of the course, students will be able to

CO1	Use appropriate words in a professional context.	Understand
CO2	Gain understanding of basic grammatic structures and use them in right context.	Understand
CO3	Speak fluently and accurately in formal and informal communicative contexts	Understand
CO4	Write definitions, descriptions, narrations and essays on various topics	Understand
CO5	Express their opinions effectively in both oral and written medium of communication	Analyze

SYLLABUS

UNIT I INTRODUCTION TO COMMUNICATION (9)

EFFECTIVE COMMUNICATION:(1)

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

FUNDAMENTALS OF COMMUNICATION: (8)

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

LAB ACTIVITY: Extempore (Oral), Conversation on asking directions, Listening – Telephone conversation; Speaking Self-introduction; Telephone conversation – Video conferencing etiquette.

UNIT II NARRATION AND SUMMATION (9)

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

LAB ACTIVITY: Listening – Travel podcast; Speaking – Narrating and sharing personal experiences through a podcast, Autobiography of a famous Personality

UNIT III DESCRIPTION OF A PROCESS / PRODUCT (9)

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

LAB ACTIVITY: Listening – Railway / Airport Announcements, Travel Vlogs; Speaking – Describing a place or picture description

UNIT-IV VISUALIZATION AND CLASSIFICATION (9)

Listening – TED talks Speaking – Interviewing a celebrity/Famous Personality Reading – Company profiles, Business Letters Vocabulary– Discourse Markers, Linking words and Phrases Collocation. Grammar – Pronouns, Conjunction, Preposition Writing – Interpretation of Charts and Graphs

LAB ACTIVITY: Picture Description, about purchasing a product, Summarizing a TED talk, Role play, Narrating an unforgettable event

UNIT V EXPRESSION COMMUNICATION (9)

Listening – Watching Movies / Listening to Dialogues and Conversations Speaking – Role play, Panel Discussion, Debate Reading – Blogs, Novels, Short Stories Vocabulary – Phrasal Verbs Grammar– Simple/Compound/Complex Sentences, Error Spotting, Punctuation. Writing – Descriptive Essay, Dialogue Writing

LAB ACTIVITY: Listening /Reading Comprehension, Developing a story using given Vocabulary, Mini Presentation on General topic (ICT tools), Group Discussion

TOTAL PERIODS: 45

TEXTBOOKS

Technical Communication: Principles and Practice Meenakshi Raman & Sangeeta Sharma Oxford University Press 3rd Edition (or latest)

Communication Skills Sanjay Kumar & Pushp Lata, Oxford University Press, 2nd Edition (2015)

Effective Technical Communication*:* M. Ashraf Rizvi, McGraw-Hill Education, 2nd Edition (2017)

1.A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications (India) Pvt. Ltd.(English For Technical Communication (With CD) By Aysha Viswamohan, McGraw-Hill Education, ISBN : 0070264244.)

2. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.

3. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.

Mapping with Programme Outcomes											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1	1	-	-	2	-	-	-	-	3	2
CO2	1	2	-	-	2	-	-	2	-	3	2
CO3	1	2	-	-	-	-	-	1	-	3	2
CO4	1	3	-	-	3	-	1	2	-	3	2
CO5	1	2	-	-	2	-	1	3	-	3	2

Assessment Methodology	**Assessment Tools**	**Marks**
Test		15
Listening and reading Comprehension	Online tool	5
Speaking assessment (Oral)	review	10
Online assessment test	Online tool	10
Content creation Competition	Peer review	5
Attendance		5
Total		**50**

25UPHP27	APPLIED PHYSICS LAB	Category	L	T	P	Credit
		BS	0	0	2	1

Course Prerequisite:

- Basic Programming Knowledge

Course Objective:

- To improve the knowledge about the theory learned in the class. To improve ability to analyze experimental result and write laboratory report.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Perform the experiments based on laser and fiber optics and its characteristics.	Analyse
CO2	Perform the experiments using a spectrometer.	Analyse
CO3	Perform experiments on semiconductor devices and analyze their characteristics.	Analyse

LIST OF EXPERIMENTS

1. Determination of angle of divergence of a laser beam using laser.
2. Determination of particle size of lycopodium powder using semiconductor laser.
3. Determination of wavelength of laser light using semiconductor laser diffraction.
4. Determination of numerical aperture and acceptance angle in an optical fiber.
5. Determination of Dispersive power of a prism using Spectrometer.
6. Determination of wavelength of mercury spectrum – spectrometer grating .
7. Determination of band gap of a semiconductor.
8. Determination of solar cell characteristics**.**

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
STEM based model creation	Presentation	5
Attendance		10
Total		**60**

25UAIP27	PYTHON PROGRAMMING LAB	Category	L	T	P	Credit
		BS	0	0	4	2

Course Prerequisite:

- Programming Knowledge in C

Course Objective:

- To improve the programming knowledge in Python and its various components.

EXPERIMENTS

1. Identify and solve simple real-life/scientific/technical problems. (Electricity Billing, Retail shop billing, Sin series, etc).
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists and tuples.
5. Implementing real-time/technical applications using Sets and dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets &Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of a shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8 Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
9. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age, validity, student mark range validation)
10. Create a Python module with basic math functions and import it into another program.
11. Exploring Pygame tool. Developing a game activity using Pygame, like bouncing ball, car race, etc.
12. Create a simple Tkinter window with title and size.
13. Create a GUI with Label, Button, Entry box, and display the entered text on button click.
14. Design a GUI form with radio buttons and checkboxes and print selected options.
15. Use message box to show an alert or confirmation dialog.
16. Write a program to draw a square, circle, and triangle using Turtle.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2	2	1	-	-	-	-	-	-	3
CO 2	3	2	2	1	-	-	-	-	-	-	3
CO 3	3	2	2	1	-	-	-	-	-	-	3
CO 4	3	2	2	1	-	-	-	-	-	-	3
CO 5	3	3	3	2	-	-	-	-	-	3	3

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Mini Project	demo	10
Attendance		10
Total		**60**

25UGEP29	ENGINEERING GRAPHICS AND AUTO CAD LAB	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite:

- Basic knowledge of geometry and fundamentals of computer operation.

Course Objective:

- To provides hands-on training in engineering drawing techniques and the use of AutoCAD software. The objective is to equip students with the skills to produce accurate 2D and 3D technical drawings, interpret engineering details, and apply CAD tools for design documentation.

Course Outcome

On the successful completion of the course, students will be able to

CO1	Use drawing instruments and follow BIS standards in manual drawings.	Understand
CO2	Develop orthographic and isometric projections manually	Analyze
CO3	Create and modify 2D drawings using AutoCAD	Apply
CO4	Generate sectional and dimensioned views in AutoCAD.	Evaluate
CO5	Apply CAD tools to visualize and plot engineering components.	Apply

Syllabus

UNIT-I

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning. Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and planes

UNIT-II

Projection of Solids and Sections of solids

UNIT-III

Development of surfaces

UNIT-IV

Isometric projections and Conversion of pictorial to Orthographic views

UNIT-V

Computer Aided Drafting: Introduction to Computer Graphics and Drafting, AutoCAD,2-D diagrams of simple geometries using Auto- CAD script.

Text Books:

1. K.R.Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics,Inzinc Publishers, 2007.

REFERENCES

1. N.D.Bhatt, Engineering Drawing,49th edition,Chorotar Publishing House,2006.
2. K.Venugopal, Engineering DrawingandGraphics+AutoCAD,4th edition,NewAgeInternational Publication Ltd.,2004.
3. DavidIcook and Robert NMc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn.1985.
4. James D Bethuneandet.al., Modern Drafting,PrenticeHallInt.,1989.

CO PO Mapping											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	-	-	-		-	-	-	-	-	-
CO2	3	-	-	-		-	-	-	-	-	-
CO3	-	-	3	-	3	-	-	-	-	-	-
CO4	-	-	2	-	2	-	-	-	-	-	-
CO5	-	-		-	2	-	-	-	-	-	-

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
Circuit Construction Task	demo	5
Attendance		10
Total		**60**

25UPCE21	COMMUNICATION SKILLS	Category	L	T	P	Credit
		EEC	0	0	2	0

Prerequisite: Carrier Development Skills

Preamble/ Course Objective: Ability to plan and manage their career paths effectively. It focuses on developing self-assessment, goal setting, and decision-making skills. Students will learn to research career options and align them with personal strengths and values.

Course Outcome

On the successful completion of the course, the students will be able to

CO1	Develop sustained motivation and enhance interpersonal skills for effective communication and teamwork.
CO2	Build active listening and conversation skills essential for collaborative and respectful team interactions
CO3	Strengthen reading comprehension and writing clarity through critical analysis and audience-focused expression.
CO4	Improve public speaking and presentation skills while fostering self-assessment through SWOT analysis.
CO5	Promote team collaboration and communication through practical activities like debates and group problem-solving

Syllabus

UNIT 1: **10 Hrs**

Motivation –II: Intrinsic vs. Extrinsic Motivation- Goal Setting and Achievement - Building and Sustaining Motivation **Interpersonal skills:** Effective Communication - Active Listening - Conflict Resolution - Teamwork and Collaboration

UNIT 2: **10Hrs**

Listening Skills: Roles and Responsibilities in a Team - Building Trust and Respect Among Team Members – Effective Team Communication

Conversation skills: Starting and Maintaining a Conversation - Non-Verbal Communication Cues- Active Listening and Responding.

UNIT 3: **10 Hrs**

Reading Skills: Skimming and Scanning Techniques – Critical reading and Interpretation

Writing Skills:Grammar and Syntax - Clarity and Conciseness- Audience Awareness

UNIT 4: **10 Hrs**

Presentation Speaking Skills: Speech Structure and Organization – Verbal Delivery Techniques**Public speaking skills**: Confidence and overcoming Anxiety –Effective message Delivery

SWOT Analysis: Identifying Internal Factors – Analyzing External Factors

UNIT 5: **8 Hrs**

Team Building: Roles and Responsibilities in a team – Communication and Trust – Conflict resolution and Problem Solving

Active Sessions: Debate – Picture Connector

Text Books:

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education

Reference Books:

1. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.
2. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA
4. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1:								2	2	2	2
CO2:									3	3	
CO3:										3	
CO4:								2		2	2
CO5:									3	3	

25UMCC21	IKS IN HUMANITIES AND SOCIAL SCIENCE	Category	L	T	P	Credit
		MCC	1	0	1	0

Course Prerequisite:

- Basic understanding of Indian history and culture

Course Objective:

- This course explores Indian Knowledge Systems in the context of humanities and social sciences, providing students with a deeper understanding of India's intellectual heritage.

Course Outcomes:

On the successful completion of the course, students will be able to:

CO1	Understand the philosophical foundations and methodologies of Indian knowledge systems in the humanities.	Understand
CO2	Analyze Indian contributions to literature, arts, social organization, and governance systems	Analyze
CO3	Apply principles from Indian philosophical traditions to contemporary social and ethical issues	Apply
CO4	Evaluate the relevance and adaptability of traditional knowledge in modern social contexts	Evaluate
CO5	Create connections between ancient wisdom and contemporary challenges in society	Create

Syllabus

UNIT I: Philosophical Foundations of Indian Knowledge Systems (6 Hours) - Darshanas (Schools of Philosophy): Samkhya, Yoga, Nyaya, Vaisheshika, Mimamsa, Vedanta - Epistemology in Indian philosophy: Pramanas (means of knowledge) - Ethics and moral philosophy in Indian traditions - Concept of Dharma, Artha, Kama, and Moksha - Comparative study with Western philosophical traditions

UNIT II: Indian Literary and Artistic Traditions (6 Hours) - Sanskrit literature: Vedas, Upanishads, Puranas, Epics (Ramayana, Mahabharata) - Classical poetry and drama: Kalidasa, Bhartrhari, Bhasa - Regional literature and folk traditions - Indian classical music and dance: Theoretical foundations - Visual arts: Sculpture, painting, and architectural styles - Aesthetics in Indian tradition: Rasa theory and Alamkara shastra

UNIT III: Social Organization and Governance (6 Hours) - Ancient Indian social structure and organization - Varna and Ashrama systems: Historical context and evolution - Village self-governance: Panchayati Raj origins - Arthashastra: Principles of statecraft and administration - Justice system: Dharmashastra and Rajadharma - Economic systems: Trade, agriculture, and crafts

UNIT IV: Educational Systems and Knowledge Transmission (6 Hours) - Gurukula system: Teacher-student relationship - Ancient universities: Nalanda, Takshashila, Vikramshila - Oral tradition and preservation of knowledge - Women's education in ancient India - Integration of spiritual and material learning - Comparison with modern educational approach

UNIT V: Contemporary Relevance and Applications (6 Hours) - Indian knowledge systems in modern governance - Traditional conflict resolution mechanisms - Environmental consciousness in Indian traditions - Community-based development models - Gender studies: Women in Indian philosophical traditions - Relevance of Indian ethics in corporate governance - Cultural preservation and modernization challenges

LEARNING ACTIVITIES

Research Projects: 1. **Philosophical Analysis Project** - Study of a specific philosophical school - Comparison with contemporary thought - Presentation of findings

2. **Literary Heritage Study**
   - Analysis of classical texts
   - Cultural significance evaluation
   - Creative interpretation through modern media
3. **Social Systems Research**
   - Historical analysis of governance models
   - Contemporary applications study
   - Policy recommendation development
4. **Case Study Analysis**
   - Traditional knowledge applications
   - Success stories and challenges
   - Future implementation strategies

TEXTBOOKS

1. S. Radhakrishnan, "Indian Philosophy", Oxford University Press, 2008
2. A.L. Basham, "The Wonder That Was India", Rupa Publications, 2017
3. Kapila Vatsyayan, "Traditional Indian Art and Culture", Cambridge University Press, 2015

REFERENCE BOOKS

1. Heinrich Zimmer, "Philosophies of India", Princeton University Press, 1989
2. Romila Thapar, "Early India: From the Origins to AD 1300", Penguin Books, 2015
3. K.M. Munshi, "The History and Culture of the Indian People", Bharatiya Vidya Bhavan
4. Digital Library of India: https://www.dli.gov.in
5. Sahapedia - Encyclopedia of Indian Culture: https://www.sahapedia.org
6. Indian Council of Historical Research: https://ichr.ac.in
7. Archaeological Survey of India: https://asi.nic.in

Mapping with Programme Outcomes

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

25UMCC22	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	Category	L	T	P	Credit
		MCC	0	0	2	0

Course Prerequisite:

- Basic knowledge of chemistry, biology, and physics.

Course Objective:

- Understand fundamental concepts of environmental science and ecology
- Analyze environmental problems and their engineering solutions
- Develop awareness about sustainable development and green technologies
- Explore renewable energy systems and waste management strategies
- Foster environmental consciousness and responsible engineering practices

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand fundamental principles of environmental science and ecosystem dynamics	Understand
CO2	Analyze various types of pollution and their impact on human health and the environment	Analyze
CO3	Apply principles of sustainable development in engineering design and decision-making	Apply
CO4	Evaluate renewable energy technologies and waste management systems	Evaluate
CO5	Design environmentally sustainable solutions for engineering problems	Apply

SYLLABUS

UNIT IINTRODUCTION TO ENVIRONMENTAL SCIENCE AND ECOLOG (6)

Definition, scope and importance of environmental science - Structure and function of ecosystems - Biogeochemical cycles: Carbon, nitrogen, phosphorus, sulfur cycles - Biodiversity and its conservation - Environmental impact assessment principles.

UNIT IIENVIRONMENTAL POLLUTION AND CONTROL (6)

Air pollution: Sources, effects, and control measures - Water pollution: Industrial and domestic sources, treatment methods - Soil pollution: Causes, effects, and remediation techniques - Noise pollution: Sources, effects, and control - Solid waste management: 3R principles, waste-to-energy.

UNIT IIISUSTAINABLE DEVELOPMENT AND GREEN TECHNOLOGIES (6)

Concept of sustainable development and SDGs - Life cycle assessment (LCA) principles - Green building concepts and LEED certification - Cleaner production and industrial ecology - Environmental management systems (ISO 14001)

UNIT IV RENEWABLE ENERGY AND CLIMATE CHANGE (6)

Solar energy systems: Photovoltaic and thermal applications - Wind energy: Technology and site assessment - Hydroelectric and geothermal energy systems - Climate change: Causes, effects, and mitigation strategies - Carbon footprint and carbon trading mechanisms

UNIT V ENVIRONMENTAL REGULATIONS AND CASE STUDIES (6)

Environmental laws and regulations in India - Environmental clearance procedures - Corporate environmental responsibility - Case studies of environmental disasters and lessons learned - Future trends in environmental technology

TOTAL PERIODS: 30

TEXT BOOKS

1. G. Tyler Miller Jr., "Environmental Science: Working with the Earth", Cengage Learning, 2019
2. C. Anil Kumar, "Environmental Science and Engineering", PHI Learning, 2018
3. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, 2017

REFERENCE BOOK & WEB RESOURCES

1. Richard T. Wright, "Environmental Science: Toward a Sustainable Future", Pearson, 2017
2. Daniel B. Botkin, "Environmental Science: Earth as a Living Planet", Wiley, 2018
3. Central Pollution Control Board - www.cpcb.nic.in
4. Ministry of Environment and Forests - www.moef.gov.in
5. UN Environment Programme - www.unep.org
6. NPTEL Environmental Science Courses - nptel.ac.in

Mapping with Programme Outcomes

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