GM UNIVERSITY

COURSE DOCUMENT

2024 SCHEME

I-VIII SEMESTER

B.Tech in
CS-Artificial Intelligence, Block chain and Business System

GM UNIVERSITY
Innovating Minds

School of Computer Science & Technology
Faculty of Engineering & Technology

Semester-1			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS1101	Foundational Mathematics for Computer Science	3
2.	UE25CS1102	Analog & Digital Fundamentals	3
3.	UE25CS1103	Advanced Materials Integration in Computing Technology	3
4.	UE25CS1104	Problem Solving through C Programming	3
5.	UE25CS1105	Web Designing & Programming	3
6.	UE25CS1106	Project Based Learning / mini project on Web Designing	2
7.	SDTCD	Technical Competency	0
8.	CASP	Life Skills	0
9.	CIBI	Innovation and Entrepreneurial Skills	0
10.	SA	Environmental Awareness and Community Services	0
11.	SA	Athletics, Sports, Yoga, Gymnasium	0
12.	SA	Cultural & Literary Activities	0
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	0
Total			**17**

Semester-2			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS1201	Applied Mathematics for Computer Science	3
2.	UE25CS1202	Applied Physics for CSE	3
3.	UE25CS1203	Data Structures & Applications	3
4.	UE25CS1204	Python Programming	3
5.	UE25CS1205	Fundamentals of Computer Networks	3
6.	UE25CS1206	Fundamentals of DBMS	3
7.	UE25CS1207	Project Based Learning / mini project	2
8.	SDTCD	Technical Competency	2
9.	CASP	Life Skills	1
10.	CIBI	Innovation and Entrepreneurial Skills	0
11.	SA	Environmental Awareness and Community Services	1
12.	SA	Athletics, Sports, Yoga, Gymnasium	0
13.	SA	Cultural & Literary Activities	0
14.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
15.	CASP	Placement Training	0
Total			**24**

Semester-3			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS2301	Algorithm Design and Complexity Analysis	4
2.	UE25CS2302	Internet of Things	3
3.	UE25CS2303	Object Oriented Programming	3
4.	UE25CS2304	Computer Organization and Architecture	3
5.	UE25CS2305	Operating System Concepts	3
6.	UE25CS2306	Project Based Learning / mini project	2
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	1
9.	CIBI	Innovation and Entrepreneurial Skills	0
10.	SA	Environmental Awareness and Community Services	1
11.	SA	Athletics, Sports, Yoga, Gymnasium	1
12.	SA	Cultural & Literary Activities	0
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	1
Total			**24**

Semester-4			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS2401	Machine Learning	3
2.	UE25CS2402	Data Mining & Data Warehousing	3
3.	UE25CS2403	Discrete Structures for Computing	2
4.	UE25CS2404	Advanced DBMS and PL/Sql	3
5.	UE25CS2405	Automata Theory and Computations	3
6.	UE25CS2406	Project Based Learning / mini project on building a Machine Learning Model	2
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	1
9.	CIBI	Innovation and Entrepreneurial Skills	1
10.	SA	Environmental Awareness and Community Services	1
11.	SA	Athletics, Sports, Yoga, Gymnasium	1
12.	SA	Cultural & Literary Activities	1
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	1
Total			**24**

Semester-5			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS3501	Advanced Machine Learning	3
2.	UE25BS3502	**Business Management**	3
3.	UE25BS3503	**Block chain technology**	3
4.	UE25BS3504	**Computational Statistics**	3
5.	UE25BS3505	Project Based Learning / mini project	3
6.	UE25A135XX	**Professional Elective - 1**	3
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	0
9.	CIBI	Innovation and Entrepreneurial Skills	0
10.	SA	Environmental Awareness and Community Services	0
11.	SA	Athletics, Sports, Yoga, Gymnasium	1
12.	SA	Cultural & Literary Activities	0
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	1
Total			**22**

Semester-6			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25BS3601	Human- Centred AI	3
2.	UE25BS3602	**Supply Chain management**	3
3.	UE25BS3603	**Advanced Blockchain Technology**	3
4.	UE25BS3604	**E-Commerce**	3
5.	UE25BS3605	Project Based Learning / mini project on Block Chain	3
6.	UE25BS36XX	Professional Elective - 2	3
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	0
9.	CIBI	Innovation and Entrepreneurial Skills	1
10.	SA	Environmental Awareness and Community Services	0
11.	SA	Athletics, Sports, Yoga, Gymnasium	0
12.	SA	Cultural & Literary Activities	1
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	0
Total			**22**

Semester-7			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS4701	Intellectual Property Rights	3
2.	UE25CS4702	Industry Internship	3
3.	UE25CS4703	Project – 1	4
4.	UE25CS47XX	Open Elective -1	2
5.	SDTCD	Technical Competency	0
6.	CASP	Life Skills	0
7.	CIBI	Innovation and Entrepreneurial Skills	0
8.	SA	Environmental Awareness and Community Services	0
9.	SA	Athletics, Sports, Yoga, Gymnasium	0
10.	SA	Cultural & Literary Activities	1
11.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	1
12.	CASP	Placement Training	0
Total			**16**

Semester-8			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS4801	Engineering Project Management	3
2.	UE25CS4802	Project - 2	3
3.	SDTCD	Technical Competency	6
4.	CASP	Life Skills	0
5.	CIBI	Innovation and Entrepreneurial Skills	0
6.	SA	Environmental Awareness and Community Services	1
7.	SA	Athletics, Sports, Yoga, Gymnasium	0
8.	SA	Cultural & Literary Activities	0
9.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/TechnicalCompetition)	0
10.	CASP	Placement Training	1
Total			**12**

Semester – 1

Semester-1			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS1101	Foundational Mathematics for Computer Science	3
2.	UE25CS1102	Analog & Digital Fundamentals	3
3.	UE25CS1103	Advanced Materials Integration in Computing Technology	3
4.	UE25CS1104	Problem Solving through C Programming	3
5.	UE25CS1105	Web Designing & Programming	3
6.	UE25CS1106	Project Based Learning / mini project on Web Designing	2
7.	SDTCD	Technical Competency	0
8.	CASP	Life Skills	0
9.	CIBI	Innovation and Entrepreneurial Skills	0
10.	SA	Environmental Awareness and Community Services	0
11.	SA	Athletics, Sports, Yoga, Gymnasium	0
12.	SA	Cultural & Literary Activities	0
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	0
Total			**17**

Course Code	UE25CS1101
Course Title	**Foundational Mathematics for Computer Science**

Course Content

- **Linear Algebra:** Basics of Matrices, Elementary row transformation, Rank of a matrix-echelon form.
- **Solution of system of linear equations:** Consistency, Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method.
- **Eigenvalues and eigenvectors:** Definition,¬ Rayleigh's power method.
- **Differential Calculus:** Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems on Maclaurin's series.
- **Indeterminate forms:** L'Hospital's rule.
- **Partial differentiation:** Differentiation of composite functions, Jacobian and problems.
- **Modular Arithmetic:** Importance of modular arithmetic in the field of Computer science & engineering, Introduction to Congruence's, Linear Congruence's.
- **Finding GCD:** Finding GCD using Euclid's Algorithm, Remainder theorem (statement only), Solving Polynomials.
- **Linear Diophantine Equation,** System of Linear Congruence.
- **Euler's Theorem (statement only),** Wilson's Theorem (statement only) and Fermat's little theorem (statement only).
- **Numerical Methods:** Solution of algebraic and transcendental equations - Regula-Falsi and Newton-Raphson methods (only formulae).
- **Finite differences:** Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof).
- **Numerical integration:** Simpson's (1/3)rd and (3/8)th rules(without proof).
- **Numerical Solution of Ordinary Differential Equations (ODE's):** Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (No derivations of formulae).

Course Code	UE25CS1102
Course Title	**Analog and Digital Fundamentals**

Course Content

- **Semiconductor Diodes and Applications:** P-N junction diode, Equivalent circuit of diode, Rectification-Half wave rectifier, Full wave rectifier (Ripple factor, Efficiency-only Definition) Zener Diode, Zener diode as a voltage regulator, Bipolar Junction Transistor (BJT) structure, The BJT as an amplifier, The BJT as a switch: Switching operation, A simple Application of a Transistor Switch, Feedback Amplifiers and Oscillators: Introduction, Types of feedback, Gain stability with feedback, Oscillators, Phase Shift oscillator, Wien Bridge oscillator.
- **The Operational Amplifiers:** Introduction to Op-Amp, Op-Amp Input Modes: Differential mode, Common mode, Op-Amp Parameters: CMRR, Maximum output Voltage Swing, Input Offset Voltage, Input Bias Current, Input and Output Impedance, Input offset current, Slew Rate, Basic Op-Amp Circuits: Inverting amplifier, Virtual ground, Non-Inverting amplifier, Linear applications of Op-amp: Summer, Subtractor, Voltage follower, Integrator, Differentiator and Comparator Numericals.
- **Digital Concepts and Number System:** Introduction to Number Systems, Number system Conversions: Binary to Hexadecimal, Hexadecimal Conversion, Hexadecimal and Octal to binary conversion, binary to decimal conversion Principal of combinational logic: Introduction, Definition of combinational logic, Canonical forms, generation of switching equation from truth tables, Karnaugh map (Three and Four variables k-maps), quine-McCluskey minimization technique: using don't care terms.
- **Analysis and design of combinational logic:** Introduction, General approach to combinational logic design Binary Adders and Sub-tractors, comparators, Decoders, Encoders: 8:3 line priority encoder, multiplexers.
- **Flip-Flops and its Applications:** Basic Bistable elements, Latches, The master-slave flip-flops(pulse-triggered flip-flops): SR flip-flops, JK flip-flops, Edge triggered flip-flops, Characteristic equations, Registers, binary ripple counters (3 bits only) and Design of synchronous binary counters (3 bits only).

Course Code	UE25CS1103
Course Title	**Advanced Materials Integration in Computing Technology**

Course Content

- **Energy Materials for Engineering**:
  Polymers: Introduction to polymers, conducting mechanism of polyacetylene, structure and applications of conducting polyaniline and its commercial applications.
  Composites: Introduction, properties and industrial applications of carbon-based reinforced composites and metal matrix polymer composites.
  Perovskite Materials: Introduction, properties and applications in optoelectronic devices.
- **Nanotechnology and Memory Devices:**
  Nanomaterials: Introduction, preparation of nanomaterials by different approaches, size dependent properties of nanomaterials (Surface area, Catalytic, Conducting, Thermal and Electrical). Introduction, properties and applications of Nano-fibres, Nano-photonics and Nano-sensors.
  Memory Devices: Introduction, Basic concepts of electronic memory, Organic/polymer electronic memory devices, classification of electronic memory devices, types of organic memory devices (organic molecules, polymeric materials, organic inorganic hybrid materials).
- **Energy Conversion and Storage Devices:**
  Battery Technology: Introduction, characteristics, classification of batteries, Construction, working and applications of Lithium ion and Sodium ion batteries in electrical vehicles. Quantum Dot Sensitized Solar Cells (QDSSC's) - Principle, Properties and Applications. Construction, working and applications of Solar cell.
  Electrode System: Introduction, types of electrodes, Ion selective electrode – definition, construction, working and applications of glass electrode. Reference electrode- Introduction, calomel electrode– construction, working and applications of calomel electrode. Concentration cell definition, construction and numerical problems.
- **Sensors and Display Systems**
  Sensors: Introduction, working, principle and applications of electrochemical sensors, electrochemical sensors for the pharmaceuticals. Electrochemical gas sensors for Sox and NOx. Disposable sensors in the detection of biomolecules and pesticides.
  Display Systems: Liquid crystals (LC's)-Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Properties and application of Organic Light Emitting Diodes (OLED's) and Quantum Light emitting diodes (QLED's).
- **Analytical Techniques and E-waste Managements**
  Analytical Techniques: Introduction, principle and instrumentation of colorimetric sensors; its application in the estimation of copper, principle and instrumentation of potentiometric sensors; principle and instrumentation of its application in the estimation of Iron, conductometric sensors; its application in estimation of weak acid v/s strong base.
  E-Waste: Introduction, sources of e-waste, Composition and Need of E-waste management. Toxic materials used in manufacturing electronic and electrical products; health hazards due to exposure to e-waste. Recycling of E-waste by hydro metallurgical and pyro-metallurgical methods. Role of stakeholders in environmental management of e-waste: producers, consumers, recyclers, and statutory bodies.

Course Code	UE25CS1104
Course Title	**Problem Solving through C Programming**

Course Content

- **Introduction to Computer languages and C Programming:** Introduction to basic structure of a computer, evolution of computer languages. Introduction to C, Structure of C program, Steps required to create and execute a C program, design tools – algorithm, flowchart and psuedocode, C tokens, variables, constants, Input/output statements in C.
- **Operators and expressions:** Types of operators in C, evaluation of expressions and type conversion.
- **Branching and looping statements:** Introduction to decision control, conditional branching statements, looping statements, nested loops and unconditional branching.
- **Functions:** Introduction to functions, function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.
- **Arrays:** Declaration and initialization of single dimension and multi-dimensional arrays, accessing the elements of an array, passing arrays to functions, applications of arrays – searching and sorting.
- **Strings:** Introduction to strings, string taxonomy, operations on strings, miscellaneous string and character functions, arrays of strings.
- **Pointers:** Introduction to pointers, declaring pointer variables, types of pointers, passing arguments to functions using pointers, dynamic memory management using pointers.
- **Structure, Union, and Enumerated Data Type:** Structure declaration, typedef, array of structures, nested structures, pointer to structures, structures as parameter to functions, Introduction to union and enumerated data type.
- **Files:** Introduction to files in C, types of files, basic file operations, fseek and rewind.

Course Code	UE25CS1105
Course Title	**Web Designing & Programming**

Course Content

- **Traditional HTML and XHTML:** Introduction to websites, Purpose and Examples of different types of websites, Key Components of a Website: Frontend (client-side), Backend (server-side), understand how websites work, understand how the internet works. First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: The Specifications Up Close, (X) HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup—Two Paths?
- **HTML5:** Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications
- **Cascading Style Sheets (CSS):** Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, colour Properties, RGB Values for colour, Opacity Values for colour, HSL and HSLA Values for colour, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case Study: Description of a Small City's Core Area.
- **Tables and CSS, Links and Images** : Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo Class Selectors, thread and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element .
- **Introduction to JavaScript: Functions, DOM, Forms, and Event Handlers:** History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Accessing a Form's Control Values, reset and focus Methods

Course Code	UE25CS1106
Course Title	Project Based Learning / mini project on Web Designing

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

A. Weekly Review Meetings:
   - The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

B. Formal Evaluation Schedule:
   - The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
   - Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

C. Customizable Rubrics (With prior Approval):
   - Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student

performance throughout the semester.

Semester – 2

Semester-2			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS1201	Applied Mathematics for Computer Science	3
2.	UE25CS1202	Applied Physics for CSE	3
3.	UE25CS1203	Data Structures & Applications	3
4.	UE25CS1204	Python Programming	3
5.	UE25CS1205	Fundamentals of Computer Networks	3
6.	UE25CS1206	Fundamentals of DBMS	3
7.	UE25CS1207	Project Based Learning / mini project	2
8.	SDTCD	Technical Competency	2
9.	CASP	Life Skills	1
10.	CIBI	Innovation and Entrepreneurial Skills	0
11.	SA	Environmental Awareness and Community Services	1
12.	SA	Athletics, Sports, Yoga, Gymnasium	0
13.	SA	Cultural & Literary Activities	0
14.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0

Course Code	UE25CS1201
Course Title	**Applied Mathematics for Computer Science**

Course Content

- Descriptive Statistics: Concept of primary and secondary data, Methods of collection of primary data. Measures of central tendency : Arithmetic mean, median, mode, geometric mean and harmonic mean .Absolute and relative measures of dispersion : range, quartile deviation, mean deviation, standard deviation and variance with simple applications .
- Vector Calculus : Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems, Vector spaces : Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension, Linear transformations: Definition and examples, Algebra of transformations, Matrix of a linear transformation.
- Curve fitting by the method of least squares: Fitting the curves of the form $y = ax +$, $y = axb$, $y = ax2 + bx +$, Correlation: Karl Pearson's coefficient of Correlation and rank correlation (without repetition) –problems, Regression analysis: lines of regression –problems, angle between the lines of regression.
- Review of basic probability theory: Random variables (discrete and continuous), probability mass and density functions, Mathematical expectation, mean and variance. Probability Distribution: Binomial, Poisson, normal distribution -problems (derivation for mean and standard deviation for Binomial and Poisson distributions only)- Illustrative examples.
- Joint Probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance. Sampling theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of Hypothesis: Test of Hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit.

Course Code	UE25CS1202
Course Title	**Applied Physics for CSE**

Course Content

- **Quantum Mechanics:** de Broglie Hypothesis and Matter Waves, de Broglie wavelength and expression by analogy, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle and its application (Non- existence of electron inside the nucleus - Relativistic), Principle of Complementarity, Wave Function, Time independent Schrödinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Particle inside one dimensional infinite potential well, Quantization of Energy States, Waveforms and Probabilities. Numerical**.**
- **Quantum Computing:** Quantum Computing: Principles of Quantum Information & Quantum Computing: Introduction to Quantum Computing, Moore's law & its end, Differences between Classical & Quantum computing. Concept of qubit and its properties. Representation of qubit by Bloch sphere. Single and Two qubits. Extension to N qubits.

  Dirac representation and matrix operations: Matrix representation of 0 and 1 States, Identity Operator I, Applying I to|0⟩and |1⟩ states, Pauli Matrices and its operations on |0⟩and |1⟩states, Explanation of i) Conjugate of a matrix and ii) Transpose of a matrix. Unitary matrix U, Examples: Row and Column Matrices and their multiplication (Inner Product), Probability, Quantum Superposition, normalization rule. Orthogonality, Orthonormality. Numerical Problems, **Quantum Gates: Single Qubit Gates:** Quantum Not Gate, Pauli – X, Y and Z Gates, Hadamard Gate, Phase Gate (or S Gate), T Gate, **Multiple Qubit Gates:** Controlled gate, CNOT Gate, (Discussion for 4 different input states). Representation of Swap gate, Controlled -Z gate, Toffoli gate.
- **Applications of Physics in Computing:** Physics of Animation: Taxonomy of physics-based animation methods, Frames, Frames per Second, Size and Scale, Weight and Strength, Motion and Timing in Animations, Constant Force and Acceleration, The Odd rule, Odd-rule Scenarios, Motion Graphs, Examples of Character Animation: Jumping, Parts of Jump, Jump Magnification, Stop Time, Walking: Strides and Steps, Walk Timing. Numerical Problems**.**

  Statistical Physics for Computing: Descriptive statistics and inferential statistics, Poisson distribution and modeling the probability of proton decay, Normal Distributions (Bell Curves), Monte Carlo Method: Determination of Value of π. Numerical Problems.
- **Communication and Networking: Laser and Optical Fibers**

Lasers: Characteristic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients and Expression for Energy Density, Laser Action, Population Inversion, Metastable State, Requisites of a laser system, Semiconductor Diode Laser, Applications: Bar code scanner, Laser Printer, Laser Cooling (Qualitative), Numerical Problems.**Optical Fiber:** Principle and Structure, Propagation of Light, Acceptance angle and Numerical Aperture (NA), Derivation of Expression for NA, Modes of Propagation, RI Profile, Classification of Optical Fibers, Attenuation and Fiber Losses, Applications: Fiber Optic networking, Fiber Optic Communication. Numerical Problems.

- **Semiconductors and Superconductors for Computing Applications: Semiconductors:** Fermi level in Intrinsic and extrinsic Semiconductor, Expression for the concentration of electrons in conduction band & holes concentration in valance band, Relation between Fermi energy and energy gap in intrinsic semiconductors, Hall effect, Expression for Hall coefficient and its application.**Superconductors:** Introduction to Super Conductors, Temperature dependence of resistivity, Meissner's Effect, Critical Field, Temperature dependence of Critical field, Types of Super Conductors, BCS theory (Qualitative), Quantum Tunnelling, High-Temperature superconductivity, Josephson Junctions (Qualitative), DC and RF SQUIDs (Qualitative), Applications in Quantum Computing: Charge, Phase and Flux qubits, Numerical Problems.

Course Code	UE25CS1203
Course Title	**Data Structures & Algorithms**

Course Content

- **Introduction To Data Structures:** Data Structures, Classifications , Data structure Operations ,**Review of** pointers and dynamic Memory Allocation, Arrays, Dynamic Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, representation of Multidimensional Arrays, Strings.
- **Stacks , Queues, Linked Lists-1:** Stacks, Stacks Using Dynamic Arrays, Evaluation and conversion of Expressions, Queues, Circular Queues, Using Dynamic Arrays, Singly Linked, Lists and Chains, Representing Chains in C, Linked Stacks and Queues.
- **Linked Lists-2, Trees** : Additional List Operations, Doubly Linked List. TREES: Introduction, Binary Trees, Binary Tree Traversals, Binary Search trees, Selection Trees, Forests, Representation of Disjoint sets, Counting Binary Trees.
- **Graphs & Hashing:** The Graph Abstract Data Types, Elementary Graph Operations, HASHING: Introduction, Static Hashing, Dynamic Hashing.
- **Priority Queues & Efficient Binary Search Trees:** Single and double ended Priority Queues, Leftist Trees INTRODUCTION TO EFFICIENT BINARY SEARCH TREES: Optimal Binary Search Trees.

Course Code	UE25CS1204
Course Title	**Python Programming**

Course Content

- Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types.
- FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, *Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.
- Regular Expressions: Introduction, Special Symbols and Characters, Res and Python Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules
- GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers
- Database Programming: Introduction, python Database Application Programmer's interface (DB-API), Object Relational Managers (ORMs), Related Modules.

Course Code	UE25CS1205
Course Title	**Fundamentals of Computer Networks**

Course Content

- Introduction to networks: Network hardware, Network software, Reference models, Physical Layer: Guided transmission media, Wireless transmission
- The Data link layer: Design issues of DLL, Error detection and correction, Elementary data link protocols, Sliding window protocols. The medium access control sublayer: The channel allocation problem, Multiple access protocols.
- The Network Layer: Network Layer Design Issues, Routing Algorithms, Internetworking, The Network Layer on the internet.
- The Transport Layer: The Transport Service, Elements of transport protocols, Congestion control, the internet transport protocols.
- Application Layer: Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service.

Course Code	UE25CS1206
Course Title	**Fundamentals of DBMS**

Course Content

- **Introduction to Databases:** Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach, Brief History of Database Applications
- **Database System Concepts and Architecture**: Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces.
- **Data Modeling Using the Entity–Relationship (ER) Model**: Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for Database, ER Diagrams, Naming Conventions, and Design Issues, Example of Other Notation: UML Class Diagrams.
- **Case Studies for ER Diagram**: University Database System, Library Information System, Employee Management System - identify entities, relationships, and attributes accurately and use proper notation to represent cardinality and participation constraints, Construct appropriate Schemas.
- **Relational Algebra and Relational Calculus**: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus.

Course Code	UE25CS1208
Course Title	**Project Based Learning/Or mini project**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

A. Weekly Review Meetings:
   - The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

B. Formal Evaluation Schedule:
   - The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
   - Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

C. Customizable Rubrics (With prior Approval):
   - Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

Semester – 3

Semester-3			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS2301	Algorithm Design and Complexity Analysis	4
2.	UE25CS2302	Internet of Things	3
3.	UE25CS2303	Object Oriented Programming	3
4.	UE25CS2304	Computer Organization and Architecture	3
5.	UE25CS2305	Operating System Concepts	3
6.	UE25CS2306	Project Based Learning / mini project	2
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	1
9.	CIBI	Innovation and Entrepreneurial Skills	0
10.	SA	Environmental Awareness and Community Services	1
11.	SA	Athletics, Sports, Yoga, Gymnasium	1
12.	SA	Cultural & Literary Activities	0
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	1
Total			**24**

Course Code	UE25CS2301
Course Title	**Algorithm Design and Complexity Analysis**

Course Content

- **Introduction:** What is an Algorithm? It's Properties. Algorithm Specification-using natural language, using Pseudo code convention, Fundamentals of Algorithmic Problem solving, Analysis Framework- Time efficiency and space efficiency, Worst-case, Best-case and Average case efficiency. Performance Analysis: Estimating Space complexity and Time complexity of algorithms. Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ) with examples, Basic efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples.
- **Divide and Conquer:** General method, Recurrence equation for divide and conquer, solving it using Master's theorem. , Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum, Binary search, Merge sort, Quick sort. Decrease and Conquer Approach: Introduction, Insertion sort, Graph searching algorithms, Topological Sorting. It's efficiency analysis..
- **Greedy Method:** General method, Coin Change Problem, Knapsack Problem, solving Job sequencing with deadlines Problems. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm with performance analysis. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes. Transform and Conquer Approach: Introduction, Heaps and Heap Sort.
- **Dynamic Programming:** General method with Examples, Multistage Graphs. Transitive Closure: Warshall's Algorithm. All Pairs Shortest Paths: Floyd's Algorithm, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem. Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching- Harspool's algorithm. .
- **Backtracking:** General method, solution using back tracking to N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles Problems. Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem NP-Complete and NP-Hard problems: Basic concepts, non- deterministic algorithms, P, NP, NP- Complete, and NP-Hard classes.

Course Code	UE25CS2302
Course Title	**Internet of Things**

Course Content

- Emergence of IoT: Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components, Addressing Strategies in IoT
- IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics
- IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.
- IoT Connectivity Technologies: Introduction, IEEE 802.15.4, Zigbee, Thread, ISA100.11A,
- WirelessHART, RFID, NFC, DASH7 ,Z-Wave ,Weightless ,Sigfox ,LoRa ,NB-IoT ,Wi-Fi ,Bluetooth.
- IoT Communication Technologies: Introduction, Infrastructure Protocols: Internet protocol
- version 6 (IPv6), LOADng, RPL ,6LoWPAN. Data Protocols: MQTT, CoAP ,AMQP,XMPP ,SOAP, REST, WebSocket.
- IOT Case Studies and Future Trends
- Agricultural IoT – Introduction and Case Studies
- Vehicular IoT – Introduction
- Healthcare IoT – Introduction, Case Studies
- Paradigms, Challenges, and the Future: Introduction, Evolution of New IoT, Paradigms Challenges associated with IoT, Emerging Pillars of IoT

Course Code	UE25CS2303
Course Title	**Object Oriented Programming**

Course Content

- An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings
- Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements.
- Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class, A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited,
- Inheritance: Inheritance, using super, creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class. Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces,
- Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses.

Course Code	UE25CS2304
Course Title	**Computer Organization and Digital Circuits/Architecture**

Course Content

- **Basic Structure of Computers:** Functional Units, Basic Operational Concepts, Bus structure, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.
- **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instruction and Instruction sequencing, Addressing Modes.
- **Input/output Organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access: Bus Arbitration.
- **Memory System:** Basic Concepts, Speed, Size, and Cost, Cache Memories – Mapping Functions.
- **Basic Processing Unit:** Some Fundamental Concepts: Register Transfers, Performing ALU operations, fetching a word from Memory, Storing a word in memory. Execution of a Complete Instruction, Single bus & Multiple Bus Organization. **Pipelining:** Basic concepts of pipelining.
- **Karnaugh maps:** minimum forms of switching functions, two and three variable Karnaugh maps, four variable karnaugh maps, determination of minimum expressions using essential prime implicants, Quine-McClusky Method: determination of prime implicants, the prime implicant chart, simplification of incompletely specified functions, simplification using map-entered variables.
- **Combinational Logic:** Introduction, Combinational Circuits, Design Procedure, Gate delays and Timing diagrams, Hazards in combinational Logic. Binary Adder- Subtractor, Decoders, Encoders, Multiplexers.
- **Sequential Logic:** Introduction, Sequential Circuits, Storage Elements: Flip-Flops: Set Reset Latch, Gated Latches, Edge-Triggered D Flip Flop 3, SR Flip Flop, J K Flip Flop, T Flip Flop, Flip Flop with additional inputs, Asynchronous Sequential Circuits.

Course Code	UE25CS2305
Course Title	**Operating System Concepts**

Course Content

- **Introduction to operating systems, System structures**: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments.
- **Operating System Services**: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System debugging, Operating System generation; System boot.
- **Process Management**: Process concept; Process scheduling; Operations on processes; Inter process communication
- **Multi-threaded Programming**: Overview; Multithreading models; Thread Libraries; threading issues.
- **Process Scheduling**: Basic concepts; Scheduling Criteria; Scheduling Algorithms – FCFS, SJF, Round Robin and Priority Scheduling; Thread scheduling; Multiple-processor scheduling
- **Process Synchronization**: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization;
- **Deadlocks**: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.
- **Memory Management**: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.
- **Virtual Memory Management**: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.
- **File System, Implementation of File System**: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing;
- **Implementing File system**: File system structure; File system implementation; Directory implementation; Allocation methods; free space management.
- **Secondary Storage Structure, Protection**: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix.

Course Code	UE25CS2308
Course Title	**Project Based Learning on Management and Entrepreneurship**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

D. Weekly Review Meetings:
   - The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

E. Formal Evaluation Schedule:
   - The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
   - Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

F. Customizable Rubrics (With prior Approval):
   - Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

Semester – 4

Semester-4			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS2401	Machine Learning	3
2.	UE25CS2402	Data Mining & Data Warehousing	3
3.	UE25CS2403	Discrete Structures for Computing	2
4.	UE25CS2404	Advanced DBMS and PL/Sql	3
5.	UE25CS2405	Automata Theory and Computations	3
6.	UE25CS2406	Project Based Learning / mini project on building a Machine Learning Model	2
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	1
9.	CIBI	Innovation and Entrepreneurial Skills	1
10.	SA	Environmental Awareness and Community Services	1
11.	SA	Athletics, Sports, Yoga, Gymnasium	1
12.	SA	Cultural & Literary Activities	1
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	1
Total			**24**

Course Code	UE25CS2401
Course Title	**Machine Learning**

Course Content:

- Introduction to AI : What is artificial intelligence?, Problems, problem spaces and search, Heuristic search techniques
- Concept Learning: Knowledge representation issues, Predicate logic, Representation knowledge using rules. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm. Introduction to clustering, K-means clustering, K-Mode Clustering.
- Decision Tree Learning: Introduction, Decision tree representation, appropriate problems, ID3 algorithm. Artificial Neural Network: Introduction, NN representation, appropriate problems, Perceptron, Backpropagation algorithm.
- Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, MDL principle, Bates optimal classifier, Gibbs algorithm, Naive Bayes classifier, BBN, EM Algorithm.
- Instance-Base Learning: Introduction, k-Nearest Neighbour Learning, Locally weighted regression, Radial basis function, Case-Based reasoning. Reinforcement Learning: Introduction, The learning task, Q-Learning.

Course Code	UE25CS2402
Course Title	**Data Mining & Data Warehousing**

Course Content

- **Data Warehousing:** Basic Concepts - What Is a Data Warehouse?, Differences between Operational Database Systems and Data Warehouses, Why Have a Separate Data Warehouse?, A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading
- **Data Cube:** A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures, Typical OLAP Operations.
- **Efficient Data Cube computation:** An overview, Indexing OLAP Data: Bitmap index and join index, Efficient processing of OLAP Queries, OLAP server Architecture, ROLAP versus MOLAP Versus HOLAP.
- **Data Mining:** Introduction: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity.
- **Association Analysis:** Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm.
- **Classification:** Decision Trees Induction, Rule Based Classifiers, Nearest Neighbour Classifiers.
- **Clustering Analysis:** Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph- Based Clustering.

Course Code	UE25CS2403
Course Title	**Discrete Structures for Computing**

Course Content

- **Fundamentals of Logic:**Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. Fundamentals of Logic contd.: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.
- **Properties of the Integers:**The Well Ordering Principle – Mathematical Induction,
- **Fundamental Principles of Counting:**The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition.
- **Relations and Functions:** Cartesian Products and Relations, Functions – Plain and One-toOne, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. **Recurrence Relations:**First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients.
- **Graph Theory:** Basic Concepts: Different types of graphs, sub graphs, walks and connectedness. Degree sequences, directed graphs, distances and self-complementary graphs. Blocks: Cut-points, bridges and blocks, block graphs and cut-point graphs, Prefix CODE.

Course Code	UE25CS2404
Course Title	**Advanced Database Management System and NoSQL**

Course Content

- **Basic SQL**: SQL Data Definition and Data Types, Specifying Constraints in SQL, concepts, syntaxes and examples of Data Definition Language (DDL) create a database, drop a database, create table, drop table, alter table, DQL (Data query language) – SELECT, Data Manipulation Language (DML)- INSERT, UDATE, DELETE, Data Control Language (DCL)- GRANT, REVOKE and Transaction Control Language (TCL)- COMMIT, ROLLBACK and SAVEPOINT.
- **Laboratory:**
  a. Implementation of DDL commands of SQL with suitable examples: Create table; Alter table; Drop Table
  b. Study and Implementation of different types of constraints.
  c. Implementation of DML commands of SQL with suitable examples: Insert; Update; Delete
- **Structured Query Language (continued)**: Create relationships between database tables, Null values, aggregate functions - min, max, count, average, sum, nested sub-queries, group by, having, exists, order by. Join operations - inner, left join, right join, natural join and Cartesian product, Views (Virtual Tables) in SQL

  Laboratory:
  a. Implementation of different types of function with suitable examples- Number function, Aggregate Function, Character Function.
  b. Implementation of different types of operators in SQL- Arithmetic Operators, Logical Operators, Comparison Operator, Set Operation.
  c. Implementation of different types of Joins- Inner Join, Outer Join, Natural Join.
  d. Study and Implementation of Group By & having clause, Order by clause.
  e. Study & Implementation of Sub queries, Views.
- **Basics of Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.
- **NoSQL:** Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL.
- **NoSQL- Aggregate Data Models**: Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores,

Summarizing Aggregate Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schemeless Databases, Materialized Views, Modelling for Data Access.

Course Code	UE25CS2405
Course Title	**Automata Theory and Computations**

Course Content

- Introduction to Automata Theory: Central Concepts of Automata theory, Deterministic Finite Automata(DFA), Non- Deterministic Finite Automata(NFA) ,Epsilon- NFA, NFA to DFA Conversion, Minimization of DFA,Introduction to Compiler Design: Language Processors, Phases of Compilers
- Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Proving Languages Not to Be Regular, Lexical Analysis Phase of compiler Design: Role of Lexical Analyser, Input Buffering , Specification of Token, Recognition of Token.
- Context Free Grammars: Definition and designing CFGs, Derivations Using a Grammar, Parse Trees, Ambiguity and Elimination of Ambiguity, Elimination of Left Recursion, Left Factoring.
  Syntax Analysis Phase of Compilers: part-1: Role of Parser, Top-Down Parsing
- Push Down Automata: Definition of the Pushdown Automata, The Languages of a PDA.
  Syntax Analysis Phase of Compilers: Part-2: Bottom-up Parsing, Introduction to LR Parsing: SLR
- Introduction to Turing Machine: Problems that Computers Cannot Solve, The Turing machine problems, Programming Techniques for Turing Machine, Extensions to the Basic Turing Machine, Intermediate-Code Generation- Variants of Syntax Trees, and Three-Address Code.
  Code Generation- Three-Address Code. Code Generation

Course Code	UE25CS2406
Course Title	**Project Based Learning on building a Machine Learning Model**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

G. Weekly Review Meetings:

- The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

H. Formal Evaluation Schedule:

- The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
- Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

I. Customizable Rubrics (With prior Approval):

- Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

Semester – 5

Semester-5			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS3501	Advanced Machine Learning	3
2.	UE25BS3502	**Business Management**	3
3.	UE25BS3503	**Block chain technology**	3
4.	UE25BS3504	**Computational Statistics**	3
5.	UE25BS3505	Project Based Learning / mini project	3
6.	UE25A135XX	**Professional Elective - 1**	3
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	0
9.	CIBI	Innovation and Entrepreneurial Skills	0
10.	SA	Environmental Awareness and Community Services	0
11.	SA	Athletics, Sports, Yoga, Gymnasium	1
12.	SA	Cultural & Literary Activities	0
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0
14.	CASP	Placement Training	1
Total			**22**

Course Code	UE23AI3501
Course Title	Advanced Machine Learning

Course Content

- **Advanced Machine Learning:** Overview, Gradient Descent algorithm, Scikit-learn library for ML, Advanced Regression models, Advanced ML algorithms, KNN, ensemble methods.
- **Forecasting:** Overview, components, moving average, decomposing time series, autoregressive Models **Clustering:** Introduction, Types of clustering, Partitioning methods of clustering (k-means, k-medoids), hierarchical methods **Recommender System:** Datasets, Association rules, Collaborative filtering, User-based similarity, item-based similarity, using surprise library, Matrix factorization **Text Analytics:** Overview, Sentiment Classification, Naïve Bayes model for sentiment classification, using TF-IDF vectorizer, Challenges of text analytics
- **Neural networks:** Introduction, Neural Network Representation – Problems – Perceptron – Multilayer Networks and Back Propagation Algorithms

Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.**Instance Based Learning:** ntroduction, k-nearest neighbour learning (review), locally weighted regression, radial basis function, cased-based

Course Code	UE23BS3502
Course Title	Business Management

Course Content

Introduction to Business Management: Overview of Business Management, Importance of Management in Organizations, Evolution of Management Theories, Roles and Responsibilities of Managers, **Planning:** Strategic Planning, Operational Planning, SWOT Analysis, Goal Setting and Objectives, Decision Making and Problem Solving

Organizing: Organizational Structure and Design, Delegation and Authority, Job Design and Specialization,Team Building and Group Dynamics, Organizational Culture, **Leading:** Leadership Styles and Theories, Motivation and Employee Engagement

Controlling: Key Performance Indicators (KPIs), Budgeting and Financial Control, Quality Control and Continuous Improvement, Monitoring and Evaluation, Performance Appraisal

Human Resource Management: Recruitment and Selection, Training and Development, Employee Relations, Diversity and Inclusion**, Marketing Basics:** Marketing Principles, Market Research, Product Life Cycle, Pricing Strategies

Entrepreneurship and Innovation: Basics of Entrepreneurship, Innovation and Creativity, Business Models, Start-up Challenges and Strategies, **Business Ethics and Corporate Social Responsibility:** Ethical Decision Making, Corporate Social Responsibility (CSR), Sustainability in Business

Course Code	UE23BS3503
Course Title	Blockchain Technology

Course Content

- History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy:Block chain Architecture and Design-Basic crypto primitives: Hash, Signature Hash chain to Block chain-Basic consensus mechanisms.
- Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains.
- Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:-Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.
- Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance- Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.
- Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

Course Code	UE23BS3504
Course Title	Computational Statistics

Course Content

- **Probability and Sampling (4 hours)**: Probability basics, Random variables, Probability distributions, sampling techniques. **Data Exploration and Preparation (4 hours):** Data visualization, Summary statistics, Data cleaning and transformation, Data pre-processing.
- **Inferential Statistics (4 hours):** Hypothesis testing, Confidence intervals, Parametric vs. nonparametric tests, Monte Carlo simulations **Probability Density Estimation (4 hours)**: Probability density functions, Histograms and kernel density estimation, Maximum Likelihood Estimation (MLE)
- **Statistical Pattern Recognition (4 hours):** Pattern recognition fundamentals, Nonparametric regression, Classification and clustering techniques, Feature engineering
- **Data Mining and Knowledge Representation (4 hours):** Data mining process, Concept learning and concept description, Knowledge representation techniques **Decision Trees and Algorithms (4 hours)**: Decision tree basics, ID3, C4.5, CHAID, and CART algorithms, Pruning and tree optimization Ensemble learning (e.g., Random Forests),
- **Pre-processing and Post-processing (4 hours):** Data pre-processing steps in detail, Feature extraction, selection, and construction, Handling missing data, Post-processing techniques **Association Rule Mining (4 hours):** A priori algorithm and market basket analysis, Frequent item sets and association rules, Rule evaluation and applications

Course Code	UE23BS3505
Course Title	**Project Based Learning on Computational Statistics**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

J. Weekly Review Meetings:
   - The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

K. Formal Evaluation Schedule:
   - The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
   - Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

L. Customizable Rubrics (With prior Approval):
   - Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

Course Code	UE23CS35XX
Course Title	**Professional Elective 1**

Sl	Course Code	Course Title	Credits
1	UE25CS3540	Devops Essential	3
2	UE25CS3541	Principles of Artificial Intelligence	3
3	UE25CC3542	Object Oriented Modelling & Design	3
4	UE25CS3543	Ethical Hacking	3
5	UE25CS3544	Information Network Security	3
6	UE25CS3545	Advanced Cryptography	3

Course Code	UE25BS3508
Course Title	**Project Based Learning on Computational Statistics**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

M. Weekly Review Meetings:

- The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

N. Formal Evaluation Schedule:

- The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
- Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

O. Customizable Rubrics (With prior Approval):

- Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

Semester – 6

Semester-6			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25BS3601	Human- Centred AI	3
2.	UE25BS3602	**Supply Chain management**	3
3.	UE25BS3603	**Advanced Blockchain Technology**	3
4.	UE25BS3604	**E-Commerce**	3
5.	UE25BS3605	Project Based Learning / mini project on Block Chain	3
6.	UE25BS36XX	Professional Elective - 2	3
7.	SDTCD	Technical Competency	2
8.	CASP	Life Skills	0
9.	CIBI	Innovation and Entrepreneurial Skills	1
10.	SA	Environmental Awareness and Community Services	0
11.	SA	Athletics, Sports, Yoga, Gymnasium	0
12.	SA	Cultural & Literary Activities	1
13.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	0

Course Code	UE25AI3601
Course Title	**Human-centred AI**

Course Content

WHAT IS HUMAN-CENTERED ARTIFICIAL INTELLIGENCE: Introduction, Are People and Computers in the Same Category?, Will Automation, AI, and Robots Lead to Widespread Unemployment?

HUMAN-CENTERED AI FRAMEWORK: Introduction, Defining Reliable, Safe, and Trustworthy Systems, Two-Dimensional HCAI Framework, Design Guidelines and Examples

DESIGN METAPHORS: Introduction, Science and Innovation Goals, Intelligent Agents and Supertools, Teammates and Tele-bots, Social Robots and Active Appliances

GOVERNANCE STRUCTURES – 1: Introduction, Reliable Systems Based on Sound Software Engineering Practice, Safety Culture through Business Management Strategies, Trustworthy Certification by Independent Oversight

GOVERNANCE STRUCTURES – 2: Government Interventions and Regulations, Introduction: Driving HCAI.

Course Code	UE25BS3602
Course Title	**Supply Chain Management**

Course Content

- **Introduction:** Supply Chain – Fundamentals –Evolution- Role in Economy - Importance - Decision Phases Supplier Manufacturer-Customer chain. - Enablers/ Drivers of Supply Chain Performance. Supply chain strategy - Supply Chain Performance Measures **Strategic Sourcing Outsourcing:** Make Vs buy - Identifying core processes - Market Vs Hierarchy - Make Vs buy continuum - Sourcing strategy - Supplier Selection and Contract Negotiation. Creating a world class supply base- Supplier Development - World Wide Sourcing.
- **Warehouse Management Stores management-**management-stores systems and procedures-incoming materials control stores accounting and stock verification Obsolete, surplus and scrap-value analysis-material handling transportation and traffic management -operational efficiency-productivity-cost effectiveness-performance measurement. Supply Chain Network Distribution Network Design – Role - Factors Influencing Options, Value Addition –Distribution Strategies - Models for Facility Location and Capacity allocation. Distribution Center Location Models
- **Supply Chain Network optimization models:** Impact of uncertainty on Network Design - Network Design decisions using Decision trees Planning Demand, -multiple item -multiple location inventory management. Pricing and Revenue Management.
- **Current Trends:** Supply Chain Integration - Building partnership and trust in Supply chain Value of Information: Bullwhip Effect - Effective forecasting - Coordinating the supply chain. Supply Chain restructuring, Supply Chain Mapping - Supply Chain process restructuring, Postpone the point of differentiation – IT in Supply Chain - Agile Supply Chains -Reverse Supply chain. Future of IT in supply chain- EBusiness in supply chain.

Course Code	UE25CS3603
Course Title	**Blockchain Technology**

Course Content

- History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy:Block chain Architecture and Design-Basic crypto primitives: Hash, Signature Hash chain to Block chain-Basic consensus mechanisms.
- Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains.
- Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:-Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.
- Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance- Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.
- Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

Course Code	UE25DS3606
Course Title	**Devops Essential**

Course Content

- **Introduction to DevOps:** Definition and Evolution of DevOps, Understanding the need for DevOps, Historical context and evolution of DevOps, Core DevOps Principles and practices, Collaboration and communication, Automation, Infrastructure as Code (IaC), Monitoring and feedback, Benefits and goals of DevOps.
- **DevOps Culture:** Cultural Shift in DevOps, Breaking down silos, Encouraging collaboration, fostering a culture of continuous improvement, Agile methodology, Lean principles, Continuous Integration (CI), Continuous Deployment (CD), Continuous Monitoring.
- **DevOps Lifecycle**: Planning, Agile planning and project management, User stories and backlog grooming, Development, Version control (e.g., Git), Code review and collaboration, Testing, Automated testing, Test-driven development (TDD), Integration testing, Deployment, CI/CD pipelines, Release management, Deployment automation.
- **Version Control Systems and Continuous Integration (CI):** Introduction to Version Control, Git Basics, Branching and Merging, Git Workflow, Git Best Practices, Introduction to CI/CD, Jenkins Overview, Setting up Jenkins, Jenkins Best Practices.
- **Security in DevOps and Case Studies:** DevSecOps Principles, Security Best Practices, Automated Security Testing, Compliance as Code, DevOps Success Stories, Challenges and Solutions, Industry Trends, Emerging Technologies in DevOps.

Course Code	UE23CS35XX
Course Title	**Professional Elective 2**

Sl	Course Code	Course Title	Credits
1	UE25CS3640	Wireless Adhoc Networks	3
2	UE25CS3641	Malware Analysis	3
3	UE25CS3642	Sensor and Sensing Systems	3
4	UE25CS3643	Security threat and Vulnerability	3
5	UE25CS3644	Data wrangling using Python	3
6	UE25CS3645	Cyber Security and Secure Systems	3

Course Code	UE25DS3608
Course Title	**Project Based Learning on DevOps**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

P. Weekly Review Meetings:

- The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

Q. Formal Evaluation Schedule:

- The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
- Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

R. Customizable Rubrics (With prior Approval):

- Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

Semester – 7

Semester-7			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS4701	Intellectual Property Rights	3
2.	UE25CS4702	Industry Internship	3
3.	UE25CS4703	Project – 1	4
4.	UE25CS47XX	Open Elective -1	2
5.	SDTCD	Technical Competency	0
6.	CASP	Life Skills	0
7.	CIBI	Innovation and Entrepreneurial Skills	0
8.	SA	Environmental Awareness and Community Services	0
9.	SA	Athletics, Sports, Yoga, Gymnasium	0
10.	SA	Cultural & Literary Activities	1
11.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/Technical Competition)	1
12.	CASP	Placement Training	0
Total			**16**

Course Code	UE25CS4701
Course Title	**Software Engineering**

Course Content

- Software Engineering and Software Process: The Nature of Software, The Unique Nature of Webapps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How it all Starts, Process Models: A Generic Process Model, Process Assessment and Improvement, Perspective Process Models. The unified Process. Personal and Team Process Models. Process Technology, Product and Process.
- Requirements Engineering: Functional and non-functional requirements. The software requirements document. Requirements specification. Requirements engineering processes. Requirements elicitation and analysis. Requirements validation. Requirement management
- Object Oriented Modelling concepts: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO Development, OO modelling history. Modelling as Design technique: Modelling as Design technique, Modelling, abstraction. The Three models. Class Modelling: Object and Class Concept, Link and associations concepts; Generalization and Inheritance, A sample class model, Navigation of class models.
- System Models and Architectural Design: Context models. Interaction models. Structural models. Behavioural models. Model-driven engineering. Software Architecture, Architectural Genres, Architectural Styles, Architectural Design.
- Software Testing and Software Evolution: Development testing, Test-driven development, Release testing, User testing. Evolution processes. Program evolution dynamics. Software maintenance. Legacy system management.

Course Code	UE25CS4701
Course Title	**Intellectual Property Rights**

Course Content

- Overview of Intellectual Property: Definition of intellectual property, Types of intellectual property, patents, trademarks, copyrights, trade secrets, Importance of intellectual property in fostering innovation and creativity. Intellectual Property Laws and Treaties: Introduction to key international treaties (e.g., TRIPS Agreement), Understanding national and regional intellectual property laws, Comparison of intellectual property laws across jurisdictions.
- Patents: Basics of patent protection, Patentable subject matter, Patent application process, Rights and limitations conferred by a patent, Trademarks: Nature and purpose of trademarks, trademark registration process, Trademark rights and enforcement, Trademark infringement and defences.
- Copyrights: Understanding copyright protection, Copyrightable works, Copyright registration process, Fair use and exceptions to copyright protection. Trade Secrets: Definition and characteristics of trade secrets, Protection and management of trade secrets, Trade secret vs. patent protection.
- Licensing and Technology Transfer: Licensing as a strategy for leveraging intellectual property, Technology transfer and its role in innovation, Negotiating and drafting licensing agreements. IPR Enforcement and Litigation: Remedies for intellectual property infringement, Legal proceedings and litigation in intellectual property cases, Alternative dispute resolution mechanisms.
- Ethical and Social Considerations: Ethical issues in intellectual property, Balancing public interest and private rights, Social and cultural implications of intellectual property. International Perspectives on IPR: Comparative analysis of intellectual property systems globally, Global challenges and cooperation in intellectual property.

Course Code	UE25CS4702
Course Title	**Industry Internship**

Course Content

The primarily learning experiences gained through hands-on work may facilitate learning and provide guidance to interns. Thus complement practical experiences with guidance and support, helping interns maximize their learning and development.

Assessing interns during their internship is crucial for evaluating their performance and ensuring they meet the desired learning outcomes. Combining multiple assessment approaches provides a comprehensive view of interns' performance and growth. The assessment methods for an internship program:

Problem Understanding:

- To assess the quality and completion of assigned projects.
- Enable insight to accuracy, creativity, timelines, and overall contribution.

Performance Reviews:

- Regular performance reviews is scheduled by supervisors to discuss progress, challenges, and goals.
- Use feedback, address concerns, and guide interns in their learning.

Presentation and Communication Skills:

- Assess interns through presentations.
- Evaluate Clarity, organization, engagement, and effectiveness of communication.
- The projects key findings are presented to a panel who check articulated ideas and queries.

Professionalism and Ethical Conduct:

- The Assessment adherence to professional and ethical standards.
- The Punctuality, reliability, ethical decision-making, and respect for confidentiality.
- To evaluate interns' professionalism, factors meeting deadlines, company policies, maintaining confidentiality.

Final Presentation or Report:

Remember that the goal of teaching during an internship is Adjust these teaching strategies based on the specific needs and objectives of the internship program.

- The interns must present a comprehensive overview of their internship experience.
- Integration of learning, overall impact, and ability to synthesize experiences.
- Organize a final presentation which reflect on their learning, and contributions.

Course Code	UE25CS4703
Course Title	**Project - 1**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

S. Weekly Review Meetings:

- The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

T. Formal Evaluation Schedule:

- The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
- Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

U. Customizable Rubrics (With prior Approval):

- Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

Semester – 8

Semester-8			
S. No.	**Course Code**	**Course Title**	**Credits**
1.	UE25CS4801	Engineering Project Management	3
2.	UE25CS4802	Project - 2	3
3.	SDTCD	Technical Competency	6
4.	CASP	Life Skills	0
5.	CIBI	Innovation and Entrepreneurial Skills	0
6.	SA	Environmental Awareness and Community Services	1
7.	SA	Athletics, Sports, Yoga, Gymnasium	0
8.	SA	Cultural & Literary Activities	0
9.	SASP	Co-Curricular Activities (Seminar/Conference/Exhibition/TechnicalCompetition)	0
10.	CASP	Placement Training	1
Total			**12**

Course Code	UE25CS4801
Course Title	**Engineering Project Management**

Course Content

- Introduction to Project Management: Overview of Project Management, Definition of project management, Importance of project management in engineering
- Project Life Cycle: Phases of project life cycle, Project initiation, planning, execution, monitoring, and closure, Project Constraints: Time, cost, and scope constraints, balancing project constraints, Project Planning: Work Breakdown Structure (WBS), Creating a WBS, WBS as a foundation for project planning
- Project Scheduling: Gantt charts and network diagrams, Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT), Risk Management: Introduction to Risk Management, Identifying project risks, Qualitative and quantitative risk analysis Risk Response Planning: Strategies for handling project risks, Contingency and mitigation plans
- Project Execution and Monitoring: Project Execution, Team management and leadership, Communication in project management, Monitoring and Controlling Projects, Performance measurement and control, Change control processes
- Project Closure and Lessons Learned: Project Closure, Closing processes and documentation, Handover and customer acceptance, Lessons Learned - Importance of lessons learned, Continuous improvement in project management, Modern techniques in Engineering Project Management: Agile Project Management, Introduction to agile methodologies, Scrum and Kanban in engineering projects, Stakeholder Management: Identifying and managing stakeholders, Stakeholder communication, Ethical considerations in project management, including issues related to stakeholder relationships, Environmental impact and the responsible use of resources

Course Code	UE25CS4805
Course Title	**Project -2**

This course follows a 100% Continuous Evaluation (CE) model, with the following weight distribution:

Evaluation Component	Weightage (%)	Remarks
Problem Definition & Proposal	10%	Clarity, Feasibility, Innovation
Project Planning & Progress	20%	Timeline, Milestones, Resource Utilization
Implementation & Execution	30%	Technical Implementation, Quality of Solution
Report & Documentation	20%	Structure, Clarity, Completeness
Presentation & Demonstration	20%	Communication, Delivery, Effectiveness

Additional Evaluation Requirements:

V. Weekly Review Meetings:
   - The project guide must conduct a dedicated 1-hour review meeting every week to monitor progress, provide feedback, and ensure timely completion of milestones.

W. Formal Evaluation Schedule:
   - The project and its progress must be evaluated three times per semester, aligning with major academic milestones.
   - Evaluations will take place alongside theoretical course tests, as scheduled in the Calendar of Events for the semester.

X. Customizable Rubrics (With prior Approval):
   - Guides may define rubric-specific evaluation criteria tailored to the nature and complexity of the project.

Since this course does not have a Semester End Examination (SEE), the final grade will be based entirely on Continuous Evaluation (CE), ensuring a comprehensive assessment of student performance throughout the semester.

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