MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem: I / I** **Department: IT**

MA101BS: Matrices and Calculus

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Unit
MA101BS.1	**Apply** matrix concepts including rank, echelon/normal forms, Gauss–Jordan inverse, LU decomposition, Gauss elimination and Gauss–Seidel iteration to **solve** systems of linear equations.	3	Applying	Unit I
MA101BS.2	**Determine** eigenvalues and eigenvectors, **analyze** properties of symmetric/orthogonal/unitary/Hermitian matrices, **use** Cayley–Hamilton theorem, and **reduce** quadratic forms to canonical form.	3	Applying	Unit II
MA101BS.3	**Explain** Mean Value Theorems, **use** Taylor series expansion, and **evaluate** improper integrals using Beta and Gamma functions.	3	Applying	Unit III
MA101BS.4	**Apply** partial differentiation, total derivatives, Jacobians, Euler's theorem, and Lagrange multipliers to **find** maxima and minima of multivariable functions.	3	Applying	Unit IV
MA101BS.5	**Compute** double and triple integrals in Cartesian, polar, cylindrical, and spherical forms and **apply** them to determine areas and volumes.	3	Applying	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	2	1	–	–	–	–	–	1	–	2	3	2	3	1
CO2	3	2	1	1	–	–	–	–	–	1	–	2	2	1	3	1
CO3	3	2	1	1	–	–	–	–	–	1	–	2	2	1	3	1
CO4	3	3	2	1	–	–	–	–	–	1	–	2	2	1	3	1
CO5	3	3	2	1	–	–	–	–	–	1	–	2	2	1	3	1
Average	**3.0**	**2.6**	**1.6**	**1.0**	–	–	–	–	–	**1.0**	–	**2.0**	**2.2**	**1.2**	**3.0**	**1.0**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1 (Engineering Knowledge):** Strong mapping because matrices, eigenvalues, quadratic forms, and multivariable calculus form a core mathematical foundation for engineering. **PO2 (Problem Analysis):** Students analyze functions, integrals, multivariable problems, and system solvability. **PSO3 (Mathematical Concepts):** Strong mapping due to heavy algebraic and calculus-based reasoning needed for advanced computing.
Moderate Contribution (2 – Moderate)	**PO3 (Design/Development):** Moderate linkage through solving mathematical models, optimization, and transformations. **PO12 (Life-long Learning):** Mathematics is a continuous learning domain; these fundamentals enable future courses. **PSO1:** Moderate mapping because mathematical modeling supports computer science problem structures.
Minor Contribution (1 – Slight)	**PO10:** Students explain steps, justify results, and present mathematical reasoning. **PSO4:** Slight mapping through analytical thinking supporting research/problem formulation.
No Direct Mapping	**PO5, PO6, PO7, PO8, PO9, PO11:** Not directly related to tools, society, environment, ethics, teamwork, or project management.
Cognitive Alignment	COs operate at **BTL-3 (Applying)** and **BTL-2 (Understanding)** — correct for a **first-year foundational mathematics** course.

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MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem:** I / I **Department:** IT

CH101BS: Engineering Chemistry

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Unit
CH101BS.1	**Describe** water treatment processes and **identify** key quality parameters	2	Understanding	Unit I
CH101BS.2	**Apply** corrosion control methods to **solve** material degradation problems	3	Applying	Unit II
CH101BS.3	**Classify** polymeric materials based on their structural properties	4	Analyzing	Unit III
CH101BS.4	**Analyze** fuel characteristics to **select** appropriate energy sources	4	Analyzing	Unit IV
CH101BS.5	**Recommend** engineering materials for specific technological applications	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	2	1	1	-	2	2	-	-	1	-	1	1	-	1	2
CO2	3	2	2	1	-	1	2	-	-	1	-	2	1	-	1	2
CO3	3	2	2	1	-	1	1	-	-	1	-	1	1	-	1	2
CO4	3	2	1	1	-	2	3	-	-	1	-	2	1	-	1	2
CO5	3	2	2	1	-	1	1	-	-	1	-	1	1	-	1	2
Average	**3**	**2**	**1.6**	**1**	**–**	**1.4**	**1.8**	**–**	**–**	**1**	**–**	**1.4**	**1**	**–**	**1**	**2**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1 (Engineering Knowledge)** - Fundamental chemical principles for engineering materials and processes. **PO7 (Environment)** - Direct environmental focus through water treatment and pollution control technologies.
Moderate Contribution (2 – Moderate)	**PO2 (Problem Analysis)** - Analyzing chemical processes and material selection problems. **PO6 (Society)** - Societal impact of clean water and sustainable energy solutions. **PSO4 (Research Ability)** - Enables research in material science and green computing applications.
Minor Contribution (1 – Slight)	**PO3 (Design)** - Material selection in engineering design. **PO4 (Investigation)** - Chemical analysis and experimental investigation. **PO12 (Life-long Learning)** - Foundation for advanced materials and energy technologies. **PSO1 (Computer Systems)** - Understanding materials for hardware components. **PSO3 (Mathematical Concepts)** - Support for computational chemistry applications.
No Mapping	**PO5, PO8, PO9, PO10, PO11, PSO2** - Tool usage, ethics, teamwork, communication, project management, and software development not covered.
Cognitive Alignment	**BTL 2–5 (Understanding → Evaluating)** - Progressive development from chemical principles understanding to material evaluation and recommendation.

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MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem: I / I** **Department: IT**

CS101ES: Programming for Problem Solving

Course Outcomes

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

CO Code	Course Outcome AVG	BTL	Cognitive Domain (Keyword)	Linked Unit
CS101ES.1	Explain program development steps and construct algorithms, flowcharts, and basic C programs using variables, operators, conditionals, loops, and I/O.	2	Understanding	Unit I
CS101ES.2	Apply C programming constructs to implement arrays, strings, structures, unions, and pointer-based data operations.	3	Applying	Unit II
CS101ES.3	Implement preprocessor directives and perform file handling (text/binary) including structured data I/O and random file access.	3	Applying	Unit III
CS101ES.4	Analyze functional decomposition and implement modular programs using recursion and dynamic memory allocation.	4	Analyzing	Unit IV
CS101ES.5	Analyze and implement searching and sorting algorithms while comparing their efficiency using basic complexity concepts.	4	Analyzing	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	2	2	1	1	1	–	–	–	1	1	–	2	1	1	1	–
CO2	3	2	2	1	2	–	–	–	1	1	–	2	2	2	1	–
CO3	3	2	2	1	3	–	–	–	1	1	–	2	2	2	1	1
CO4	3	3	2	2	2	–	–	–	1	1	–	2	2	2	2	1
CO5	3	3	2	2	2	–	–	–	1	1	–	2	2	2	2	2
Average	**2.8**	**2.4**	**1.8**	**1.4**	**2.0**	–	–	–	**1.0**	**1.0**	–	**2.0**	**1.8**	**1.8**	**1.4**	**1.0**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1** (Engineering Knowledge): Strong mapping due to core C programming, algorithms, and computational logic. **PO2** (Problem Analysis): All COs involve algorithmic reasoning and structured problem-solving. **PO3** (Design/Development): Implementation of modular code, recursion, structures, and file programs. **PO5** (Modern Tools): Use of compilers, editors, debugging tools. **PSO1 & PSO2**: Core programming foundations and software development skills.
Moderate Contribution (2 – Moderate)	**PO4** (Investigation): Moderate mapping through debugging, testing, file operations, and algorithm tracing. **PO12** (Life-long Learning): C programming forms basis for continued learning in advanced programming paradigms. **PSO3** (Mathematical Concepts): Searching/sorting algorithms and complexity intuition. **PSO4** (Research Ability): Fundamentals helpful for algorithmic research and experimentation.
Minor Contribution (1 – Slight)	**PO9** (Teamwork): Lab-based group exercises and collaborative coding tasks. **PO10** (Communication): Flowcharts, documentation, and code explanation.
No Mapping	**PO6, PO7, PO8, PO11** — These relate to societal impact, ethics, sustainability, and project management, which are not part of this introductory programming theory course.
Cognitive Alignment	The COs progress from **Understanding (BTL2) → Applying (BTL3) → Analyzing (BTL4)**, matching Year-1 expectations: **Lower-order 20%

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MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem: I / I** **Department: IT**

EE101ES – Basic Electrical Engineering

Course Outcomes

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

CO Code	Course Outcome AVG	BTL	Cognitive Domain (Keyword)	Linked Unit AVG
EE101ES.1	**Explain** DC circuit elements, KVL, KCL, Thevenin, Norton, superposition and first-order RL/RC transient response.	2	Understanding	Unit–I
EE101ES.2	**Describe** sinusoidal quantities, phasors, power components, AC RLC circuits, resonance and three-phase balanced systems.	2	Understanding	Unit–II
EE101ES.3	**Apply** transformer principles including ideal/practical models, equivalent circuit, losses, regulation, efficiency and autotransformer operation.	3	Applying	Unit–III
EE101ES.4	**Analyze** construction, operation and performance characteristics of DC machines, induction motors and synchronous generators.	4	Analyzing	Unit–IV
EE101ES.5	**Apply** electrical installation concepts such as LT switchgear components, wiring, earthing, batteries, energy calculations and power factor improvement.	3	Applying	Unit–V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	2	2	1	1	1	–	–	–	–	1	–	–	2	–	1	–
CO2	2	2	1	1	1	–	–	–	–	1	–	–	2	–	1	–
CO3	3	3	2	2	2	–	–	–	–	2	–	–	2	–	2	–
CO4	3	3	3	3	2	–	–	–	–	2	–	–	2	–	2	–
CO5	3	2	2	2	2	–	–	–	–	2	–	–	2	–	2	–
Average	**2.6**	**2.4**	**1.8**	**1.8**	**1.6**	**–**	**–**	**–**	**–**	**1.6**	**–**	**–**	**2**	**–**	**1.6**	**–**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1, PO2, PO3** – Strongly supported through core electrical concepts, circuit analysis, transformer performance, and machine characteristics. **PSO1** – Essential foundation for understanding electrical and computing hardware.
Moderate Contribution (2 – Moderate)	**PO4, PO5** – Moderate support via investigation of losses, efficiency, and use of basic tools/simulators. **PSO3** – Moderate contribution through power, impedance, and energy calculations.
Minor Contribution (1 – Slight)	**PO10, PO12** – Slight relevance through documentation and motivation for further learning. **PSO2** – Slight link to embedded/low-level system understanding.
No Mapping	**PO6, PO7, PO8, PO9, PO11, PSO4** – Not directly addressed in this foundational electrical engineering course.
Cognitive Alignment	**BTL 2→CO1–CO2, BTL 3→CO3–CO5, BTL 4→CO4**; aligned with Semester 1–4 cognitive requirements.

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MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem:** I / I **Department:** IT

ME101ES: Engineering Graphics

Course Outcomes

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

CO Code	Revised Outcome (One per Unit / Trade)	BTL	Cognitive Domain (Keyword)	Linked Unit / Workshop Module
ME101ES.1	**Apply** the fundamental principles of engineering graphics to construct geometric figures, conic sections, cycloids, and their representations using drafting tools and AutoCAD commands.	3	Applying	Unit I
ME101ES.2	**Generate** orthographic projections of points, lines, and plane surfaces in different positions by following BIS conventions.	3	Applying	Unit II
ME101ES.3	**Develop** sectional views and projections of right regular solids, including prisms, cylinders, pyramids, and cones inclined to reference planes.	3	Applying	Unit III
ME101ES.4	**Create** development of surfaces for right regular solids and solve intersection problems such as cylinder–cylinder intersections.	4	Analyzing	Unit IV
ME101ES.5	**Produce** isometric drawings of simple and complex solids and convert between isometric and orthographic views using conventional and CAD tools.	4	Analyzing	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	2	1	1	2	–	–	–	1	1	–	2	1	1	1	–
CO2	3	2	2	1	2	–	–	–	1	1	–	2	2	1	1	–
CO3	3	2	2	1	2	–	–	–	1	1	–	2	2	2	1	–
CO4	3	3	2	2	2	–	–	–	1	1	–	2	2	2	1	1
CO5	3	3	2	2	3	–	–	–	1	1	–	2	2	2	2	1
Average	**3.0**	**2.4**	**1.8**	**1.4**	**2.2**	–	–	–	**1.0**	**1.0**	–	**2.0**	**1.8**	**1.6**	**1.2**	**0.4**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1**: Requires strong engineering knowledge for geometry, projections, solids, intersections. **PO2**: Students interpret given 3D/2D problems and analyze spatial relations. **PO5**: Heavy use of drafting tools and CAD software for accurate drawings. **PSO1 & PSO2**: Strong for engineering fundamentals and technical drawing used in IT, CAD-based visualization.
Moderate Contribution (2 – Moderate)	**PO3**: Design component present in creating orthographic, isometric, and sectional drawings. **PO4**: Involves analytical problem-solving in intersections and developments. **PO12**: Continuous learning required to upgrade drafting/CAD skills. **PSO3**: Uses geometry and mathematical reasoning.
Minor Contribution (1 – Slight)	**PO9**: Team interaction occasionally needed for group drafting tasks. **PO10**: Communication through technical sketches and annotations. **PSO4**: Slight mapping as graphical representation supports engineering visualization for research.
No Mapping	**PO6, PO7, PO8, PO11** — This course does not address societal, environmental, ethical, or project management aspects. These do not naturally arise in Engineering Graphics.
Cognitive Alignment	BTL levels progress from **Applying (BTL3) → Analyzing (BTL4)**, matching early-year cognitive requirements. Strong orientation towards spatial reasoning and graphical problem-solving.

MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem:** I / I **Department:** IT

CS153ES: Elements of Computer Science and Engineering

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Coverage / Focus Area
CS153ES.1	**Identify** the functional units of a computer system and **describe** their working principles	2	Understanding	Unit I
CS153ES.2	**Explain** software development methodologies and **differentiate** between various types of computer languages	2	Understanding	Unit II
CS153ES.3	**Compare** different operating systems and database management systems for their specific applications	4	Analyzing	Unit III
CS153ES.4	**Analyze** computer networks and security requirements for different communication scenarios	4	Analyzing	Unit IV
CS153ES.5	**Evaluate** emerging technologies like IoT, AI, and cloud computing for real-world applications	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	2	1	1	1	-	-	-	-	1	-	2	3	1	1	1
CO2	3	2	2	1	1	-	-	-	-	1	-	2	2	3	1	1
CO3	3	3	2	2	2	-	-	-	1	1	-	2	2	2	2	2
CO4	3	3	2	2	2	1	1	1	1	1	-	2	3	2	2	2
CO5	3	3	3	2	2	2	2	1	1	2	-	3	3	3	2	3
Average	**3**	**2.6**	**2**	**1.6**	**1.6**	**0.6**	**0.6**	**0.4**	**0.6**	**1.2**	**–**	**2.2**	**2.6**	**2.2**	**1.6**	**1.8**

Justification

Aspect	Observation & Reasoning
Major Contribution (3)	**PO1 (Engineering Knowledge)** - Comprehensive foundation in computer science principles. **PSO1 (Computer Systems)** - Direct mapping to computer hardware and software components understanding. **PSO2 (Software Development)** - Core concepts of software development methodologies and programming languages.
Moderate Contribution (2)	**PO2 (Problem Analysis)** - Analyzing computing requirements and system configurations. **PO3 (Design/Development)** - Understanding system design principles. **PO12 (Life-long Learning)** - Foundation for continuous learning in evolving technologies. **PSO4 (Research Ability)** - Exposure to emerging technologies enabling research orientation. **PSO3 (Mathematical Concepts)** - Logical thinking for computational problem-solving.
Minor Contribution (1)	**PO4 (Investigation)** - Investigating system requirements and configurations. **PO5 (Modern Tool Usage)** - Introduction to computing tools and platforms. **PO6 (Society)** - Societal impact of computing technologies. **PO7 (Environment)** - Environmental considerations in technology deployment. **PO9 (Teamwork)** - Basic collaborative learning in computing concepts. **PO10 (Communication)** - Technical communication of computing concepts.
No Direct Mapping	**PO8 (Ethics)** - Limited coverage of ethical aspects. **PO11 (Project Management)** - Project management concepts not addressed in introductory course.
Cognitive Alignment	**BTL 2–5 (Understanding → Evaluating)** - Progressive development from fundamental understanding to critical evaluation of emerging technologies, establishing comprehensive computer science foundation.

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MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem:** I / I **Department:** IT

CH151BS – Engineering Chemistry Lab

Course Outcomes

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

CO Code	Course Outcome (Comprehensive)	BTL	Cognitive Domain (Keyword)	Coverage (Experiment Groups)
CH151BS.1	**Perform** quantitative chemical analysis using volumetric and instrumental methods to determine water quality parameters and chemical concentrations.	3	Applying	**Group A (Expt I-V):** Volumetric Analysis, Conductometry, Potentiometry - Water hardness, Fe^{2+} estimation, acid concentration
CH151BS.2	**Prepare** polymeric materials and **analyze** lubricant properties through experimental procedures to understand material characteristics.	3	Applying	**Group B (Expt VI-VII):** Polymer Preparation & Lubricants - Bakelite, Polystyrene preparation, acid value, viscosity of oils
CH151BS.3	**Evaluate** corrosion behavior and modern chemical technologies through hands-on and virtual experiments for engineering applications.	5	Evaluating	**Group C (Expt VIII-IX):** Corrosion Studies & Virtual Labs - Corrosion rate, fuel cells, smart materials, batteries, solar cells

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	2	1	2	2	2	2	1	2	1	-	2	1	-	2	2
CO2	3	2	2	2	2	1	1	1	2	1	-	2	1	-	1	2
CO3	3	3	2	3	2	2	3	1	2	2	-	3	2	-	2	3
Average	**3**	**2.33**	**1.67**	**2.33**	**2**	**1.67**	**2**	**1**	**2**	**1.33**	**–**	**2.33**	**1.33**	**–**	**1.67**	**2.33**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1 (Engineering Knowledge)** - Strong practical foundation in chemical engineering principles. **PO4 (Investigation)** - Extensive experimental investigation and analysis. **PO12 (Life-long Learning)** - Laboratory skills for continuous learning. **PSO4 (Research Ability)** - Research-oriented experimental approach.
Moderate Contribution (2 – Moderate)	**PO2 (Problem Analysis)** - Analyzing experimental results and errors. **PO5 (Modern Tool Usage)** - Using chemical instruments and virtual labs. **PO6 (Society)** - Societal impact of water quality and materials. **PO7 (Environment)** - Environmental aspects of chemicals and corrosion. **PO9 (Teamwork)** - Collaborative laboratory work. **PSO3 (Mathematical Concepts)** - Quantitative analysis and calculations.
Minor Contribution (1 – Slight)	**PO3 (Design)** - Basic experimental design. **PO8 (Ethics)** - Ethical handling of chemicals. **PO10 (Communication)** - Lab report writing. **PSO1 (Computer Systems)** - Limited connection to computer systems.
No Mapping	**PO11 (Project Management)** - Project management not covered. **PSO2 (Software Development)** - No software development components.
Cognitive Alignment	**BTL 3–5 (Applying → Evaluating)** - Strong focus on practical application and critical evaluation of experimental results.

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B.Tech. I Semester
Regulation: MR22 **Year/Sem: I / I** **Department: IT**

CS151ES : Programming for Problem Solving Laboratory
Course Outcomes
After successful completion of this course, the students will be able to:

CO Code	Course Outcome	BTL	Cognitive Domain	Coverage / Focus Area
CS151ES.1	**Develop** and **implement** C programs using control structures, arrays, and functions to solve computational problems.	3	Applying	**Group A (Practice a-h):** Basic Programs - Operators, type conversion, numeric problems, expression evaluation, prime numbers, Fibonacci series
CS151ES.2	**Apply** pointers, structures, and file handling concepts to create efficient data management solutions in C programming.	3	Applying	**Group B (Arrays, Pointers, Files):** Advanced Concepts - Array operations, matrix functions, file operations, string manipulations, structures and pointers
CS151ES.3	**Design** and **evaluate** complex programming solutions incorporating multiple concepts including sorting, searching, and dynamic memory allocation.	6	Creating	**Group C (Miscellaneous & Sorting):** Complex Applications - Menu-driven programs, pattern generation, sorting algorithms, searching methods, advanced problem-solving

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	2	2	3	-	-	-	2	2	-	2	2	3	3	1
CO2	3	3	3	2	3	-	-	-	2	2	-	2	2	3	3	2
CO3	3	3	3	3	3	-	-	-	3	2	-	3	3	3	3	3
Average	**3**	**3**	**2.67**	**2.33**	**3**	**–**	**–**	**–**	**2.33**	**2**	**–**	**2.33**	**2.33**	**3**	**3**	**2**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1 (Engineering Knowledge)** - Core programming engineering knowledge. **PO2 (Problem Analysis)** - Algorithmic problem-solving. **PO5 (Modern Tool Usage)** - Programming environments and tools. **PSO2 (Software Development)** - Professional programming skills. **PSO3 (Mathematical Concepts)** - Computational and algorithmic thinking.
Moderate Contribution (2 – Moderate)	**PO3 (Design/Development)** - Software design and development. **PO4 (Investigation)** - Debugging and testing. **PO9 (Teamwork)** - Collaborative programming. **PO10 (Communication)** - Code documentation. **PO12 (Life-long Learning)** - Programming foundation. **PSO1 (Computer Systems)** - Software-hardware interaction. **PSO4 (Research Ability)** - Innovative programming solutions.
Minor Contribution (1 – Slight)	**PO6, PO7, PO8, PO11** - Societal, environmental, ethical, and project management aspects not primary focus in programming lab.
No Mapping	**PO6, PO7, PO8, PO11** - Not applicable to programming laboratory context.
Cognitive Alignment	**BTL 3–6 (Applying → Creating)** - Strong progression from basic programming application to creative software solution design.

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MR22 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR22 **Year/Sem: I / I** **Department: IT**

EE151ES – Basic Electrical Engineering Lab
Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Coverage / Focus Area
EE151ES.1	**Apply** basic electrical principles to verify Ohm's law, KVL/KCL, network theorems (Thevenin, Norton, Superposition), and analyze transient response of RL/RC circuits.	3	Applying	Part-A: 1, 2, 3; Part-B: 1, 2
EE151ES.2	**Conduct** experiments on single-phase and three-phase systems to evaluate power, impedance, resonance, voltage/current relations, and transformer regulation & efficiency.	3	Applying	Part-A: 4, 5, 6; Part-B: 4, 5
EE151ES.3	**Analyze** performance characteristics of electrical machines including DC shunt motor, induction motor torque-speed behavior, and alternator no-load characteristics.	4	Analyzing	Part-A: 7, 8; Part-B: 3

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	2	2	2	–	–	–	–	1	–	–	2	–	2	–
CO2	3	3	2	2	2	–	–	–	–	1	–	–	2	–	2	–
CO3	3	3	3	3	2	–	–	–	–	1	–	–	2	–	2	–
Average	**3**	**3**	**2.33**	**2.33**	**2**	**–**	**–**	**–**	**–**	**1**	**–**	**–**	**2**	**–**	**2**	**–**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1, PO2, PO3, PO4** – Strongly supported through verification of laws, theorems, power measurement, characteristics of machines, and analytical experiments. **PSO1** – Strong foundation for understanding electrical hardware used in computing systems.
Moderate Contribution (2 – Moderate)	**PO5** – Use of instruments like wattmeters, ammeters, tachometers, and measuring tools. **PSO3** – Moderate link through calculations of impedance, power, regulation, and performance.
Minor Contribution (1 – Slight)	**PO10** – Slight support via recording observations, writing results, and presenting characteristics.
No Mapping	**PO6, PO7, PO8, PO9, PO11, PO12, PSO4** – Ethics, society, teamwork, sustainability, project management, and research are not addressed in this laboratory course.
Cognitive Alignment	**BTL-3 → CO1 & CO2** (experimentation, measurements). **BTL-4 → CO3** (analyzing machine characteristics). Complies with Sem-1/2 laboratory expectations.

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MR22 – Revised Course Outcome
B.Tech. I Semester
Regulation: MR22 **Year/Sem: I / I** **Department: IT**

MC101BS: Environmental Science
Course Outcomes
After successful completion of this course, the students will be able to:

CO Code	Course Outcome	BTL	Cognitive Domain	Linked Unit
MC101BS.1	**Analyze** ecosystem structures, food chains, and biogeochemical cycles to assess ecological balance and carrying capacity.	4	Analyzing	Unit I
MC101BS.2	**Evaluate** natural resources utilization patterns and conservation methods for sustainable development.	5	Evaluating	Unit II
MC101BS.3	**Assess** biodiversity values and conservation strategies to address habitat loss and species protection.	5	Evaluating	Unit III
MC101BS.4	**Analyze** environmental pollution sources and control technologies for air, water, and soil protection.	4	Analyzing	Unit IV
MC101BS.5	**Recommend** sustainable solutions based on environmental policies, legislation, and global initiatives.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	3	3	2	1	2	-	2	1	-	1	2
CO2	2	2	2	2	1	3	3	2	1	2	-	2	1	-	1	3
CO3	2	2	1	2	1	3	3	2	1	2	-	2	1	-	1	3
CO4	2	2	2	2	2	3	3	2	1	2	-	2	1	-	1	3
CO5	2	2	2	2	1	3	3	3	2	2	-	3	1	-	1	3
Average	**2**	**2**	**1.6**	**2**	**1.2**	**3**	**3**	**2.2**	**1.2**	**2**	**–**	**2.2**	**1**	**–**	**1**	**2.8**

Justification

Aspect	Observation & Reasoning
Major Contribution (3)	**PO6 (Society)** - Direct focus on societal impact of environmental issues and community welfare. **PO7 (Environment)** - Core environmental science principles and ecological conservation strategies. **PSO4 (Research Ability)** - Environmental research methodologies and sustainable solution development.
Moderate Contribution (2)	**PO1 (Engineering Knowledge)** - Environmental engineering concepts and sustainable principles. **PO2 (Problem Analysis)** - Analysis of environmental problems and sustainability challenges. **PO4 (Investigation)** - Environmental impact assessment and investigation methods. **PO8 (Ethics)** - Environmental ethics, policies, and legal frameworks. **PO10 (Communication)** - Environmental reporting and documentation. **PO12 (Life-long Learning)** - Sustainable development concepts for continuous learning.
Minor Contribution (1)	**PO3 (Design)** - Environmental system design and sustainable planning. **PO5 (Modern Tool Usage)** - Environmental monitoring and assessment tools. **PO9 (Teamwork)** - Collaborative environmental projects and initiatives. **PSO1 (Computer Systems)** - Limited connection to environmental computing applications. **PSO3 (Mathematical Concepts)** - Basic environmental calculations and modeling.
No Direct Mapping	**PO11 (Project Management)** - Environmental project management not explicitly covered. **PSO2 (Software Development)** - No direct software development components in environmental science.
Cognitive Alignment	**BTL 4–5 (Analyzing → Evaluating)** - High-level cognitive focus on environmental system analysis, impact evaluation, and sustainable solution recommendation across all units.

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MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I / II** **Department: IT**

MA201BS: Ordinary Differential Equations and Vector Calculus

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Linked Unit
MA201BS.1	**Solve** first order ordinary differential equations using appropriate methods and apply them to real-world problems.	3	Applying	Unit I
MA201BS.2	**Analyze** higher order differential equations and apply various solution techniques for engineering applications.	4	Analyzing	Unit II
MA201BS.3	**Apply** Laplace transforms to solve ordinary differential equations and evaluate integrals.	3	Applying	Unit III
MA201BS.4	**Analyze** vector fields using differentiation operations and interpret their physical significance.	4	Analyzing	Unit IV
MA201BS.5	**Evaluate** line, surface, and volume integrals and apply vector integration theorems.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	-	-	-	-	-	1	-	2	1	1	3	1
CO2	3	3	2	2	-	-	-	-	-	1	-	2	1	1	3	1
CO3	3	3	2	2	-	-	-	-	-	1	-	2	1	1	3	1
CO4	3	3	2	2	-	-	-	-	-	1	-	2	1	1	3	1
CO5	3	3	2	2	-	-	-	-	-	1	-	2	1	1	3	1
Average	**3**	**3**	**2**	**2**	**–**	**–**	**–**	**–**	**–**	**1**	**–**	**2**	**1**	**1**	**3**	**1**

Justification

Aspect	Observation & Reasoning
Major Contribution (3)	**PO1 (Engineering Knowledge)** - Advanced mathematical foundation for engineering applications. **PO2 (Problem Analysis)** - Strong focus on differential equations and vector analysis problem-solving. **PSO3 (Mathematical Concepts)** - Direct application of mathematical methodologies for computational tasks.
Moderate Contribution (2)	**PO3 (Design/Development)** - Supports modeling and simulation design. **PO4 (Investigation)** - Mathematical investigation of complex problems. **PO12 (Life-long Learning)** - Essential mathematical tools for continuous learning.
Minor Contribution (1)	**PO10 (Communication)** - Mathematical solution presentation. **PSO1 (Computer Systems)** - Supports computational algorithms. **PSO2 (Software Development)** - Foundation for numerical methods. **PSO4 (Research Ability)** - Mathematical research foundation.
No Direct Mapping	**PO5, PO6, PO7, PO8, PO9, PO11** - Tool usage, societal, environmental, ethical, teamwork, and project management not covered.
Cognitive Alignment	**BTL 3–5 (Applying → Evaluating)** - Strong progression from equation solving to advanced vector calculus evaluation.

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MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I / II** **Department: IT**

PH201BS: Applied Physics

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Linked Unit
PH201BS.1	**Apply** quantum mechanical principles to analyze particle behavior and wave-particle duality.	3	Applying	Unit I
PH201BS.2	**Analyze** semiconductor devices and their characteristics for electronic applications.	4	Analyzing	Unit II
PH201BS.3	**Evaluate** dielectric and magnetic materials for their properties and engineering applications.	5	Evaluating	Unit III
PH201BS.4	**Assess** nanoscale materials and fabrication techniques for technological applications.	5	Evaluating	Unit IV
PH201BS.5	**Design** optical systems using laser principles and fiber optic communication concepts.	6	Creating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	2	2	2	-	-	-	-	1	-	2	3	1	2	2
CO2	3	3	2	2	2	-	-	-	-	1	-	2	3	1	2	2
CO3	3	3	2	2	2	1	1	-	-	1	-	2	3	1	2	2
CO4	3	3	2	2	2	1	1	-	-	1	-	2	3	1	2	3
CO5	3	3	3	2	2	1	1	-	-	1	-	2	3	1	2	3
Average	**3**	**3**	**2.2**	**2**	**2**	**0.6**	**0.6**	**–**	**–**	**1**	**–**	**2**	**3**	**1**	**2**	**2.4**

Justification

Aspect	Observation & Reasoning
Major Contribution (3)	**PO1 (Engineering Knowledge)** - Core physics principles for engineering applications. **PO2 (Problem Analysis)** - Analysis of physical systems and devices. **PSO1 (Computer Systems)** - Direct relevance to computer hardware and semiconductor physics.
Moderate Contribution (2)	**PO3 (Design/Development)** - Physics-based system design. **PO4 (Investigation)** - Experimental and theoretical investigation. **PO5 (Modern Tool Usage)** - Physics instruments and measurement tools. **PSO3 (Mathematical Concepts)** - Physical modeling and calculations. **PSO4 (Research Ability)** - Research in materials and devices.
Minor Contribution (1)	**PO6 (Society)** - Societal impact of physics technologies. **PO7 (Environment)** - Environmental aspects of energy. **PO10 (Communication)** - Technical reporting. **PSO2 (Software Development)** - Limited software connection.
No Direct Mapping	**PO8, PO9, PO11** - Ethics, teamwork, and project management not covered.
Cognitive Alignment	**BTL 3–6 (Applying → Creating)** - Comprehensive development from fundamental applications to optical system design.

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MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I / II** **Department: IT**

EN201HS: English for Skill Enhancement

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Mapped Unit
EN201HS.1	**Apply** vocabulary building techniques and grammatical rules to construct effective sentences.	3	Applying	Unit I
EN201HS.2	**Analyze** written texts using reading strategies to enhance comprehension and interpretation.	4	Analyzing	Unit II
EN201HS.3	**Develop** formal correspondence and professional documents following standard formats.	3	Applying	Unit III
EN201HS.4	**Create** well-structured essays and précis with logical organization and coherence.	6	Creating	Unit IV
EN201HS.5	**Prepare** technical reports and documents with appropriate style and technical vocabulary.	3	Applying	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	1	-	2	1	3	-	2	-	1	-	2
CO2	-	-	-	-	-	1	-	1	1	2	-	2	-	1	-	1
CO3	-	-	-	-	-	1	-	2	2	3	-	2	-	2	-	3
CO4	-	-	-	-	-	1	-	1	2	3	-	2	-	2	-	3
CO5	-	-	-	-	-	2	-	2	2	3	-	3	-	2	-	3
Average	**–**	**–**	**–**	**–**	**–**	**1.2**	**–**	**1.6**	**1.6**	**2.8**	**–**	**2.2**	**–**	**1.6**	**–**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10 (Communication)** - Strong focus on all aspects of professional communication skills.
Moderate (2)	**PO8 (Ethics)** - Ethical communication practices. **PO12 (Life-long Learning)** - Continuous language skill development. **PSO4 (Research Ability)** - Research documentation and reporting.
Minor (1)	**PO6 (Society)** - Societal communication aspects. **PO9 (Teamwork)** - Collaborative writing and communication. **PSO2 (Software Development)** - Technical documentation skills.
No Mapping	**PO1, PO2, PO3, PO4, PO5, PO7, PO11, PSO1, PSO3** - Technical engineering knowledge and tools not directly related to language skills.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Balanced development from grammar application to creative writing and reporting.

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MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I / II** **Department: IT**

EC201ES: Electronic Devices and Circuits

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Verb	Linked Unit
EC201ES.1	**Explain** diode characteristics, resistances, capacitances, switching behavior, and equivalent circuits.	2	Understanding	Unit–I
EC201ES.2	**Describe** diode-based rectifiers, filters, clippers, clampers, and clamping operations.	2	Understanding	Unit–II
EC201ES.3	**Apply** BJT operation principles in CE, CB, CC configurations, and evaluate biasing, stabilization, and transistor switching.	3	Applying	Unit–III
EC201ES.4	**Analyze** the operation and characteristics of JFETs, MOSFETs, pinch-off behavior, and compare FETs with BJTs.	4	Analyzing	Unit–IV
EC201ES.5	**Apply** the characteristics and working principles of special semiconductor devices such as Zener, SCR, UJT, Tunnel diode, Photo devices, LED, and Schottky diode.	3	Applying	Unit–V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	–	–	–	–	1	–	–	2	1	1	1
CO2	2	2	1	1	1	–	–	–	–	1	–	–	2	1	1	1
CO3	3	3	2	2	2	–	–	–	–	1	–	–	3	2	2	1
CO4	3	3	3	3	2	–	–	–	–	1	–	–	3	2	3	1
CO5	3	3	2	2	2	–	–	–	–	1	–	–	3	1	2	1
Average	**2.6**	**2.6**	**1.8**	**1.8**	**1.6**	–	–	–	–	**1.0**	–	–	**2.4**	**1.2**	**1.8**	**1.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 & PO2:** Fundamental electronics concepts (diodes, BJT, FET, MOSFET, special devices) strongly support applied physics & circuit understanding. **PO3:** BJT & FET applications, switching, and biasing support solution development. **PSO1:** Understanding semiconductor devices strengthens computer hardware fundamentals for IT students.
Moderate (2)	**PO4 & PO5:** Circuit investigation, biasing stability, rectifier ripple analysis, and device tools moderately support experimentation. **PSO3:** Semiconductor math models (capacitances, current equations) support analytical thinking.
Minor (1)	**PO10:** Slight contribution through documentation, circuit explanation, and report discussion. **PSO2:** Minimal relevance through study of switching devices related to logic operations. **PSO4:** Small research relevance from exposure to advanced devices (SCR, UJT, photodiodes).
No Mapping	**PO6–PO9, PO11, PO12** do not relate to societal, ethical, teamwork, environment, or management components in this electronics theory course.
Cognitive Range	CO1–CO2 → BTL2; CO3 & CO5 → BTL3; CO4 → BTL4. No BTL5/6 allowed for Sem-1/2 as per MR22.

MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I / II** **Department: IT**

PH251BS: Applied Physics Laboratory

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
PH251BS.1	**Apply** experimental methods to determine physical parameters such as work function, Planck's constant, Hall coefficient, carrier concentration, energy gap, acceptance angle, numerical aperture, magnetic field, and time constants.	3	Applying	Exp 1, 2, 7, 8, 11, 12
PH251BS.2	**Analyze** V–I, P–I and characteristic curves of semiconductor and optoelectronic devices including p–n diode, Zener diode, LED, solar cell, and laser diode.	4	Analyzing	Exp 4, 5, 6, 9
PH251BS.3	**Apply** basic electrical and physical principles to study LCR circuits, RC circuits, torsional pendulum least-squares method, and evaluate resonance and time-based behaviors.	3	Applying	Exp 3, 10, 11

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	–	2	2	–	–	–	–	1	–	–	2	–	2	1
CO2	3	3	–	3	2	–	–	–	–	1	–	–	2	–	2	1
CO3	3	2	–	2	2	–	–	–	–	1	–	–	2	–	2	1
Average	**3.0**	**2.6**	–	**2.3**	**2.0**	–	–	–	–	**1.0**	–	–	**2.0**	–	**2.0**	**1.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 & PO2:** Experiments directly apply physics fundamentals (Hall effect, photoelectric effect, LCR circuits). **PO4:** Investigative skills in determining constants, analyzing curves, and experimental evaluation.
Moderate (2)	**PO5:** Use of lab instruments (Hall setup, LCR kit, optical fiber kit, laser diode). **PSO1 & PSO3:** Physics principles support understanding of hardware systems and mathematical modeling.
Minor (1)	**PO10:** Slight contribution via observation tables and lab record writing. **PSO4:** Slight link through exposure to measurement-based experimentation.
No Mapping	**PO3, PO6–PO9, PO11, PO12, PSO2** – No design, ethics, teamwork, management, or software development aspects in a physics lab course.
Cognitive Range	CO1 & CO3 → BTL3 (Applying), CO2 → BTL4 (Analyzing); correct for Sem-1/2 lab (no BTL5/6).

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MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I / II** **Department: IT**

CS251ES: Python Programming Laboratory

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Group / Theme
CS251ES.1	**Write** and **execute** Python programs involving fundamental constructs such as variables, expressions, decision making, loops, strings, lists, tuples, dictionaries, and basic problem-solving tasks.	3	Applying	Basics, loops, conditions, lists, functions, strings, recursion
CS251ES.2	**Implement** modular and reusable Python programs using functions, recursion, exception handling, files, modules, and libraries such as NumPy, SciPy, and Matplotlib.	3	Applying	Functions, recursion, file handling, modules, exception handling, NumPy/SciPy, plotting
CS251ES.3	**Develop** object-oriented and application-level programs using classes, inheritance, graphical interfaces, digital logic simulators, and data-processing applications.	4	Analyzing	OOP, classes, MRO, validation, GUI, digital logic, adders, advanced applications

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1	2	–	–	–	1	1	–	2	2	2	1	1
CO2	3	3	2	1	3	–	–	–	1	1	–	2	2	3	2	1
CO3	3	3	3	2	3	–	–	–	1	1	–	2	2	3	2	2
Average	**3.0**	**2.6**	**2.3**	**1.3**	**2.6**	–	–	–	**1.0**	**1.0**	–	**2.0**	**2.0**	**2.6**	**1.6**	**1.3**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** Strong mapping due to core Python constructs, data structures, OOP, libraries, and problem-solving foundations. **PO2 (Problem Analysis):** Students analyze input requirements, edge cases, and logic for computational tasks. **PO5 (Modern Tool Usage):** Strong mapping because the lab includes NumPy, SciPy, Matplotlib, GUI programming, and module creation. **PSO2 (Software Development Foundations):** Strong mapping as students build reusable functions, modules, classes, and applications.
Moderate (2)	**PO3 (Design/Development):** Moderate mapping—students design functions, structured programs, and OOP systems. **PO4 (Investigation):** Investigating program behavior, debugging, testing exceptions, and validating inputs. **PO12 (Life-long Learning):** Python is a rapidly evolving language; students must explore libraries and documentation. **PSO1:** Understanding programming foundations improves computing system competence. **PSO3:** Moderate mapping through algorithmic thinking and structured problem solving.
Minor (1)	**PO9:** Occasional teamwork during lab sessions. **PO10:** Students practice code documentation, input/output specification, and presenting results. **PSO4:** Slight mapping due to exposure to exploratory tasks (digital logic simulation, GUI, file analytics).
No Mapping	**PO6, PO7, PO8, PO11:** No connection to environmental, ethical, sustainability, or management topics in Python Lab.
Cognitive Range	All COs use **Applying (BTL 3)** and **Analyzing (BTL 4)** — correct for laboratory skill-building. BTL mix matches Year 1/2 lab expectations: hands-on coding, debugging, functional decomposition, and small application development.

MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I / II** **Department: IT**

EN251HS: English Language and Communication Skills Laboratory

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Units
EN251HS.1	**Apply** pronunciation rules, speech sounds, and accent neutralization techniques for clear verbal communication.	3	Applying	**CALL Lab:** Phonetics, pronunciation, intonation, accent neutralization, listening comprehension
EN251HS.2	**Demonstrate** effective speaking skills through presentations, role-plays, and situational dialogues.	3	Applying	**ICS Lab:** Public speaking, presentations, role-plays, group discussions, interpersonal communication
EN251HS.3	**Participate** confidently in professional scenarios including interviews, meetings, and technical discussions.	3	Applying	**Professional Communication:** Interview skills, meeting etiquette, technical presentations, professional interactions

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	1	-	2	2	3	-	2	-	1	-	1
CO2	-	-	-	-	-	1	-	2	2	3	-	2	-	1	-	2
CO3	-	-	-	-	-	2	-	2	3	3	-	3	-	2	-	2
Average	**-**	**-**	**-**	**-**	**-**	**1.33**	**-**	**2**	**2.33**	**3**	**-**	**2.33**	**-**	**1.33**	**-**	**1.67**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10** - Professional communication skills & presentation abilities.
Moderate (2)	**PO8** - Ethical communication practices. **PO9** - Team discussions & collaborative speaking. **PO12** - Continuous communication skill development. **PSO4** - Research presentation & documentation skills.
Minor (1)	**PO6** - Societal communication aspects. **PSO2** - Technical documentation abilities.
No Mapping	**PO1, PO2, PO3, PO4, PO5, PO7, PO11, PSO1, PSO3** - Technical engineering knowledge not related to language skills.
Cognitive Range	**BTL 3** - Focused on practical application of communication skills in professional contexts.

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MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I /II** **Department: IT**

IT251ES: IT Workshop

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
IT251ES.1	**Assemble** computer hardware components and install operating systems with dual-boot configuration.	3	Applying	**PC Hardware:** Computer assembly, OS installation (Windows/Linux), dual-boot configuration, troubleshooting
IT251ES.2	**Utilize** internet technologies, web browsers, and cybersecurity measures for effective online operations.	3	Applying	**Internet & Web:** Browser configuration, search engines, cybersecurity, online tools, web technologies
IT251ES.3	**Apply** office productivity tools for document creation, data analysis, and professional presentations.	3	Applying	**Productivity Tools:** Word processing, spreadsheets, presentations, documentation, report preparation

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	1	2	1	-	2	3	2	1	1
CO2	2	2	1	1	3	1	1	1	1	1	-	2	2	1	1	1
CO3	2	2	1	1	3	-	-	1	1	2	-	2	2	2	1	1
Average	**2.33**	**2**	**1.33**	**1.33**	**3**	**0.33**	**0.33**	**1**	**1.33**	**1.33**	**–**	**2**	**2.33**	**1.67**	**1**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5** - Computer hardware, software & internet tools. **PSO1** - Computer systems understanding & hardware operation.
Moderate (2)	**PO1** - IT engineering fundamentals. **PO2** - Problem-solving in IT systems. **PO4** - Hardware/software investigation. **PO12** - IT skills for continuous learning.
Minor (1)	**PO3** - Basic system design. **PO6** - Societal IT impact. **PO7** - Environmental aspects of computing. **PO8** - Ethical computer use. **PO9** - Collaborative IT work. **PO10** - Technical documentation. **PSO2** - Software tool usage. **PSO3** - Basic computational concepts.
No Mapping	**PO11** - Project management beyond scope.
Cognitive Range	**BTL 3** - Practical application of IT skills across hardware, software and internet technologies.

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MR22 – Revised Course Outcome
B.Tech. II Semester

Regulation: MR22 **Year/Sem: I /II** **Department: IT**

ME251ES: Engineering Workshop

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
ME251ES.1	**Perform** basic workshop operations in carpentry, fitting, and tin-smithy trades using appropriate tools.	3	Applying	**Basic Trades:** Carpentry joints, fitting operations, tin-smithy components, tool handling
ME251ES.2	**Execute** foundry, welding, and electrical wiring practices following safety standards and procedures.	3	Applying	**Advanced Trades:** Sand molding, arc welding, house wiring, electrical installations, safety protocols
ME251ES.3	**Apply** manufacturing processes to create engineering components as per technical specifications.	3	Applying	**Manufacturing Skills:** Component fabrication, quality inspection, measurement techniques, precision work

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	2	-	-	2	2	1	-	2	1	1	1	1
CO2	2	2	2	2	2	-	-	2	2	1	-	2	1	1	1	1
CO3	2	2	2	2	2	-	-	2	2	1	-	2	1	1	1	1
Average	**2**	**2**	**2**	**2**	**2**	**–**	**–**	**2**	**2**	**1**	**–**	**2**	**1**	**1**	**1**	**1**

Justification

Aspect	Observation / Reasoning
Moderate Contribution (2)	**PO1** - Engineering workshop fundamentals. **PO2** - Manufacturing problem analysis. **PO3** - Component design & fabrication. **PO4** - Workshop investigation. **PO5** - Tools & equipment usage. **PO8** - Workshop safety ethics. **PO9** - Team-based workshop tasks. **PO12** - Manufacturing skills development.
Minor Contribution (1)	**PO10** - Workshop documentation. **PSO1** - Basic hardware fabrication. **PSO2** - Limited software connection. **PSO3** - Basic measurements. **PSO4** - Minimal research aspects.
No Direct Mapping	**PO6, PO7, PO11** - Societal, environmental & project management not covered.
Cognitive Alignment	**BTL 3** - Practical application of manufacturing skills across various engineering trades.

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MR22 – Revised Course Outcome
B.Tech. III Semester

Regulation: MR22 **Year/Sem: II /I** **Department: IT**

EC331ES: Digital Electronics

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
EC331ES.1	**Apply** Boolean algebra theorems and logic gates to design and analyze digital circuits.	3	Applying	Unit I: Boolean Algebra & Logic Gates
EC331ES.2	**Minimize** logic functions using K-map methods and implement them using universal gates.	4	Analyzing	Unit II: Gate-Level Minimization
EC331ES.3	**Design** combinational logic circuits including adders, multiplexers, and decoders for various applications.	6	Creating	Unit III: Combinational Logic
EC331ES.4	**Analyze** sequential circuits and design counters/registers using flip-flops for digital systems.	4	Analyzing	Unit IV: Sequential Logic
EC331ES.5	**Evaluate** memory systems and asynchronous sequential circuits for practical digital applications.	5	Evaluating	Unit V: Memories & Asynchronous Circuits

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	-	-	-	-	1	-	2	3	1	2	1
CO2	3	3	2	2	2	-	-	-	-	1	-	2	3	1	2	1
CO3	3	3	3	2	2	-	-	-	-	1	-	2	3	1	2	2
CO4	3	3	3	2	2	-	-	-	-	1	-	2	3	1	2	2
CO5	3	3	2	2	2	-	-	-	-	1	-	2	3	1	2	2
Average	**3**	**3**	**2.4**	**2**	**2**	**–**	**–**	**–**	**–**	**1**	**–**	**2**	**3**	**1**	**2**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Digital electronics fundamentals & circuit design. **PO2** - Digital system analysis & problem-solving. **PSO1** - Computer hardware systems & digital logic.
Moderate (2)	**PO3** - Digital circuit design & development. **PO4** - Circuit investigation & analysis. **PO5** - Digital design tools & simulators. **PO12** - Foundation for advanced digital systems. **PSO3** - Mathematical logic & Boolean algebra. **PSO4** - Digital system research & innovation.
Minor (1)	**PO10** - Technical documentation. **PSO2** - Limited software connection.
No Mapping	**PO6, PO7, PO8, PO9, PO11** - Societal, environmental, ethical, teamwork & project management not covered.
Cognitive Range	**BTL 3–6** - Strong progression from basic Boolean algebra to complex digital system design and evaluation.

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MR22 – Revised Course Outcome
B.Tech. III Semester

Regulation: MR22 **Year/Sem: II /I** **Department: IT**

MA302BS: Computer Oriented Statistical Methods

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
MA302BS.1	**Apply** probability distributions and random variables to model computer-oriented problems.	3	Applying	Unit I: Random Variables & Distributions
MA302BS.2	**Analyze** theoretical distributions including binomial, Poisson, and normal for data modeling.	4	Analyzing	Unit II: Theoretical Distributions
MA302BS.3	**Evaluate** sampling distributions and estimation techniques for statistical inference.	5	Evaluating	Unit III: Sampling & Estimation
MA302BS.4	**Test** hypotheses using appropriate statistical methods for decision making in computing.	5	Evaluating	Unit IV: Hypothesis Testing
MA302BS.5	**Design** statistical models using curve fitting and regression analysis for data interpretation.	6	Creating	Unit V: Applied Statistics

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	1	1	-	-	1	-	2	1	1	3	2
CO2	3	3	2	2	2	1	1	-	-	1	-	2	1	1	3	2
CO3	3	3	2	2	2	1	1	-	-	1	-	2	1	1	3	2
CO4	3	3	2	2	2	1	1	-	-	1	-	2	1	1	3	3
CO5	3	3	3	2	2	1	1	-	-	1	-	3	2	2	3	3
Average	**3**	**3**	**2.2**	**2**	**2**	**1**	**1**	**–**	**–**	**1**	**–**	**2.2**	**1.2**	**1.2**	**3**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Statistical methods & mathematical modeling. **PO2** - Data analysis & problem-solving. **PSO3** - Mathematical concepts & statistical computing.
Moderate (2)	**PO3** - Statistical model design. **PO4** - Data investigation & analysis. **PO5** - Statistical software tools. **PO12** - Statistical foundation for continuous learning. **PSO4** - Research methodology & data analysis.
Minor (1)	**PO6** - Societal data analysis. **PO7** - Environmental statistics. **PO10** - Statistical reporting. **PSO1** - Basic computer data analysis. **PSO2** - Statistical software applications.
No Mapping	**PO8, PO9, PO11** - Ethics, teamwork & project management not covered.
Cognitive Range	**BTL 3–6** - Strong progression from statistical application to advanced model design and hypothesis testing.

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MR22 – Revised Course Outcome
B.Tech. III Semester

Regulation: MR22 **Year/Sem: II /I** **Department: IT**

CS301PC: Data Structures

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
CS301PC.1	**Implement** linear data structures including linked lists, stacks, and queues for efficient data organization.	3	Applying	Unit I: Linear Data Structures
CS301PC.2	**Analyze** dictionary operations and hashing techniques for optimal data storage and retrieval.	4	Analyzing	Unit II: Dictionaries & Hashing
CS301PC.3	**Evaluate** search trees including BST, AVL, and B-trees for different application requirements.	5	Evaluating	Unit III: Search Trees
CS301PC.4	**Apply** graph algorithms and sorting techniques to solve complex computational problems.	3	Applying	Unit IV: Graphs & Sorting
CS301PC.5	**Design** pattern matching algorithms and trie structures for efficient string processing.	6	Creating	Unit V: Pattern Matching & Tries

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	-	-	-	1	1	-	2	2	3	3	1
CO2	3	3	2	2	2	-	-	-	1	1	-	2	2	3	3	2
CO3	3	3	3	2	2	-	-	-	1	1	-	2	2	3	3	2
CO4	3	3	3	2	2	-	-	-	1	1	-	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	2	1	-	3	3	3	3	3
Average	**3**	**3**	**2.6**	**2.2**	**2**	**–**	**–**	**–**	**1.2**	**1**	**–**	**2.2**	**2.2**	**3**	**3**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Data structure fundamentals & algorithms. **PO2** - Computational problem analysis & solving. **PSO2** - Software development with efficient data structures. **PSO3** - Mathematical modeling & algorithmic thinking.
Moderate (2)	**PO3** - Algorithm design & system development. **PO4** - Performance investigation & analysis. **PO5** - Programming tools & environments. **PO12** - Foundation for advanced algorithms. **PSO1** - Data organization in computer systems. **PSO4** - Algorithm research & optimization.
Minor (1)	**PO9** - Collaborative programming. **PO10** - Code documentation.
No Mapping	**PO6, PO7, PO8, PO11** - Societal, environmental, ethical & project management not primary focus.
Cognitive Range	**BTL 3–6** - Comprehensive progression from data structure implementation to advanced algorithm design and evaluation.

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MR22 – Revised Course Outcome
B.Tech. III Semester

Regulation: MR22 **Year/Sem: II /I** **Department: IT**

IT301PC: Computer Organization and Microprocessor

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
IT301PC.1	**Explain** the fundamental components of digital computers and analyze basic computer organization and design principles.	2	Understanding	Unit I: Digital Computers & Basic Computer Organization
IT301PC.2	**Analyze** the 8086 processor architecture, register organization, and memory addressing techniques.	4	Analyzing	Unit II: 8086 Processor Architecture
IT301PC.3	**Develop** assembly language programs using 8086 instruction set and implement stack operations and interrupt handling.	3	Applying	Unit III: Assembly Language Programming
IT301PC.4	**Evaluate** computer arithmetic operations and input-output organization methods for system performance.	5	Evaluating	Unit IV: Computer Arithmetic & I/O Organization
IT301PC.5	**Design** memory hierarchy systems and analyze pipeline processing for enhanced computer performance.	6	Creating	Unit V: Memory Organization & Pipeline Processing

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	-	-	-	-	1	-	2	3	1	2	1
CO2	3	3	2	2	1	-	-	-	-	1	-	2	3	1	2	2
CO3	3	3	3	2	2	-	-	-	-	1	-	2	3	2	2	2
CO4	3	3	2	2	2	-	-	-	-	1	-	2	3	1	2	2
CO5	3	3	3	2	2	-	-	-	-	1	-	3	3	1	2	3
Average	**3**	**3**	**2.4**	**2**	**1.6**	**–**	**–**	**–**	**–**	**1**	**–**	**2.2**	**3**	**1.2**	**2**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Computer organization fundamentals & microprocessor architecture. **PO2** - System analysis & performance evaluation. **PSO1** - Computer systems understanding & hardware architecture.
Moderate (2)	**PO3** - System design & organization. **PO4** - Computer architecture investigation. **PO12** - Foundation for advanced computer systems. **PSO3** - Mathematical concepts in computer arithmetic. **PSO4** - Computer architecture research.
Minor (1)	**PO5** - Basic computer tools & simulators. **PO10** - Technical documentation. **PSO2** - Limited software development connection.
No Mapping	**PO6, PO7, PO8, PO9, PO11** - Societal, environmental, ethical, teamwork & project management not covered.
Cognitive Range	**BTL 2–6** - Comprehensive progression from fundamental understanding to advanced system design and performance optimization.

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MR22 – Revised Course Outcome
B.Tech. III Semester

Regulation: MR22 **Year/Sem: II /I** **Department: IT**

IT302PC: Introduction to IoT

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
IT302PC.1	**Explain** IoT characteristics, physical design, functional blocks, sensing, actuation, networking basics, and communication protocols.	2	Understanding	Unit–I
IT302PC.2	**Illustrate** M2M communication, IoT–M2M differences, interoperability concepts, and integration of sensors/actuators with Arduino.	2	Understanding	Unit–II
IT302PC.3	**Apply** Python programming and Raspberry Pi interfacing techniques to build basic IoT applications.	3	Applying	Unit–III
IT302PC.4	**Analyze** IoT implementations using Raspberry Pi, SDN concepts, SDN-based IoT, and IoT data handling/analytics.	4	Analyzing	Unit–IV
IT302PC.5	**Apply** IoT concepts to cloud computing, sensor-cloud, smart cities, connected vehicles, smart grids, and industrial IoT through case studies.	3	Applying	Unit–V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	–	–	1	–	2	–	1	2	1	1	1
CO2	2	2	1	1	1	–	–	1	–	2	–	1	2	1	2	1
CO3	3	3	2	2	3	–	–	–	1	2	–	2	3	3	3	2
CO4	3	3	3	3	3	–	–	–	1	2	–	2	3	3	3	2
CO5	3	3	2	2	2	–	–	2	1	2	–	2	3	3	3	2
Average	**2.6**	**2.6**	**1.8**	**1.8**	**2.0**	–	–	**1.0**	**0.6**	**2.0**	–	**1.6**	**2.6**	**2.0**	**2.0**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO3, PO4, PO5:** IoT requires core computing, networking, analysis, and practical implementation (Arduino, Raspberry Pi, sensors, SDN). **PSO1, PSO2, PSO3:** Direct relevance to hardware, software integration, and computational/problem-solving skills.
Moderate (2)	**PO10:** Students prepare reports, documentation, and IoT project presentations. **PO12:** Encourages continuous learning due to fast-evolving IoT technologies. **PSO4:** Moderate link through case studies and analytical topics (smart cities, healthcare IoT).
Minor (1)	**PO8 & PO9:** IoT applications address societal needs (smart homes, agriculture). Minor teamwork relevance during project implementation.
No Mapping	**PO6, PO7, PO11:** IoT theory does not address ethics, environment, or engineering management.
Cognitive Range	CO1–CO2 → BTL2; CO3 & CO5 → BTL3; CO4 → BTL4. No BTL 5–6 as per Sem-3 rule.

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MR22 – Revised Course Outcome
B.Tech. III Semester

Regulation: MR22 **Year/Sem: II /I** **Department: IT**

EC361ES: Digital Electronics Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Themes
EC361ES.1	**Apply** Boolean algebra, logic gates, minimization techniques, and implement combinational circuits such as adders, subtractors, decoders, encoders, comparators, multiplexers, and code converters.	3	Applying	Exp 1–9
EC361ES.2	**Analyze** the operation of flip-flops under various triggering modes and construct sequential circuits including shift registers and synchronous/asynchronous counters.	4	Analyzing	Exp 10–14
EC361ES.3	**Apply** digital circuit design principles using simulation/experimental setup and verify functionality through truth tables, timing behavior, and hardware implementation.	3	Applying	All Experiments

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	–	–	–	1	2	–	2	3	3	3	2
CO2	3	3	3	3	3	–	–	–	1	2	–	2	3	3	3	2
CO3	3	3	2	2	3	–	–	–	1	2	–	2	3	3	3	2
Average	**3.0**	**3.0**	**2.3**	**2.3**	**3.0**	–	–	–	**1.0**	**2.0**	–	**2.0**	**3.0**	**3.0**	**3.0**	**2.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO3, PO4, PO5:** Lab focuses on Boolean algebra, logic design, combinational/sequential circuits, minimization, counters, and triggering—core engineering fundamentals. **PSO1 & PSO3:** Strong alignment with digital logic, hardware concepts, and mathematical reasoning.
Moderate (2)	**PO10:** Students document truth tables, timing diagrams, circuit results. **PO12:** Digital technologies evolve; encourages continuous learning. **PSO4:** Some relevance to IoT, automation, and computing applications.
Minor (1)	**PO9:** Collaboration in hardware experiments and breadboard implementation.
No Mapping	**PO6–PO8, PO11:** Ethics, environment, society, and management skills are not outcomes of a hardware-focused digital lab.
Cognitive Range	CO1 & CO3 → BTL3 (Apply); CO2 → BTL4 (Analyze). Fully satisfies Sem-3 lab requirement.

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MR22 – Revised Course Outcome

Regulation: MR22 | **B.Tech. III Semester** | **Year/Sem: II /I** | **Department: IT**

CS351PC: Data Structures Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Units
CS351PC.1	**Apply** linked lists, stacks, and queues using arrays and pointers to perform creation, insertion, deletion, and traversal operations.	3	Applying	Exp 1, 2, 3, 4, 5
CS351PC.2	**Apply** tree and graph data structures to implement traversal and structural operations using binary trees, balanced trees, and graphs.	3	Applying	Exp 7, 8, 9
CS351PC.3	**Analyze** the behavior of algorithms by implementing comparison-based sorting and pattern matching techniques such as quick, heap, merge sort, Boyer–Moore, and KMP on suitable datasets.	4	Analyzing	Exp 6, 10

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	–	–	–	–	2	–	1	1	3	3	–
CO2	3	3	3	3	3	–	–	–	–	2	–	1	1	3	3	–
CO3	3	3	3	3	3	–	–	–	–	2	–	2	1	3	3	–
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	–	–	–	–	**2.0**	–	**1.3**	**1.0**	**3.0**	**3.0**	–

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1–PO5:** All COs require strong programming fundamentals (PO1), problem analysis (PO2), solution design (PO3), experimentation/debugging (PO4), and use of compilers/IDEs/debuggers (PO5). **PSO2 & PSO3:** Directly support software development skills and algorithmic/data structure thinking.
Moderate (2)	**PO10:** Students explain logic, comment code, and present lab outputs, giving moderate support to communication skills. **PO12:** CO3 lightly supports self-learning by exploring algorithm behavior and performance.
Minor (1)	**PO12 (for CO1 & CO2):** Slight contribution via exploring multiple data structures and their uses. **PSO1:** Slight hardware/low-level understanding through pointers and memory behavior.
No Mapping	**PO6, PO7, PO8, PO9, PO11, PSO4:** No explicit ethics, environment, society, teamwork, project management, or research/application focus in this lab.
Cognitive Range	CS351PC.1 & CS351PC.2 → **BTL 3 (Apply)**; CS351PC.3 → **BTL 4 (Analyze)**. This satisfies lab expectations (no BTL 5/6, strong focus on implementation and analysis).

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MR22 – Revised Course Outcome
B.Tech. III Semester
Regulation: MR22 Year/Sem: II /I Department: IT

IT351PC: Internet of Things Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Group
IT351PC.1	**Apply** Arduino, Raspberry Pi and NodeMCU platforms to interface distance, temperature and LED sensors for basic IoT operations.	3	Applying	Exp 1, 2, 3
IT351PC.2	**Apply** operating system installation, device configuration and GPIO programming using Python to control and automate IoT devices.	3	Applying	Exp 4, 5
IT351PC.3	**Analyze** IoT device behavior by collecting, processing and interpreting sensor data using Raspberry Pi and Python libraries.	4	Analyzing	Exp 6

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	–	–	–	1	2	–	2	3	3	3	2
CO2	3	3	2	2	3	–	–	–	1	2	–	2	3	3	3	2
CO3	3	3	3	3	3	–	–	–	–	2	–	3	3	3	3	2
Average	**3.0**	**3.0**	**2.3**	**2.3**	**3.0**	–	–	–	**0.7**	**2.0**	–	**2.3**	**3.0**	**3.0**	**3.0**	**2.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO3, PO4, PO5:** Students interface sensors, execute Python scripts, work with GPIO, configure OS, and process sensor readings — strong engineering, problem analysis, implementation, experimentation and tool skills. **PSO1, PSO2, PSO3:** Strong mapping due to direct relevance to hardware interfacing, scripting, embedded programming and data handling.
Moderate (2)	**PO10:** Moderate through code documentation, debugging explanation and lab reporting. **PO12:** Encourages continuous learning of fast-evolving IoT tools. **PSO4:** Moderate due to application contexts (monitoring, automation, sensing).
Minor (1)	**PO9:** Slight teamwork involved during hardware experiments and debugging sessions.
No Mapping	**PO6, PO7, PO8, PO11:** No ethics, environmental issues, society impact or management components directly addressed in the lab.
Cognitive Range	CO1 & CO2 → BTL3 (Apply). CO3 → BTL4 (Analyze). Satisfies MR22 Sem-III lab cognitive rules (no BTL5/6).

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MR22 – Revised Course Outcome
B.Tech. III Semester
Regulation: MR22 Year/Sem: II /I Department: IT

CS356PC: Data visualization- R Programming/Power BI

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Themes
CS356PC.1	**Apply** Tableau to connect datasets, create basic charts, and perform foundational data visualizations for exploratory analysis.	3	Applying	Exp 1, 2
CS356PC.2	**Analyze** data using advanced visualization techniques, calculations, sorting, filtering, formatting, and customization features in Tableau.	4	Analyzing	Exp 3–7, 10
CS356PC.3	**Design** interactive dashboards and stories using Tableau for effective communication, insight generation, and publishing visual analytics.	4	Analyzing	Exp 8, 9

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	3	–	–	–	1	3	–	2	1	3	3	2
CO2	2	3	3	3	3	–	–	–	–	3	–	2	1	3	3	2
CO3	2	3	3	3	3	–	–	–	1	3	–	3	1	3	3	2
Average	**2.0**	**3.0**	**2.7**	**2.7**	**3.0**	–	–	–	**0.7**	**3.0**	–	**2.3**	**1.0**	**3.0**	**3.0**	**2.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO3, PO4, PO5, PO10:** Students perform data analysis, build advanced visuals, design dashboards, publish reports → strong analytical, technical & communication outcomes. **PSO2 & PSO3:** Strong mapping because visualization is part of software practice and analytical computation.
Moderate (2)	**PO1 & PO12:** Moderate contributions through interpreting datasets and adapting to visualization standards. **PSO4:** Moderate relevance to real-world applications and analytical storytelling.
Minor (1)	**PO9:** Slight teamwork contribution through collaborative dashboard building and story design.
No Mapping	**PO6, PO7, PO8, PO11:** Ethics, sustainability, society, management are not directly addressed in a visualization lab.
Cognitive Range	CO1 → BTL3; CO2 & CO3 → BTL4. Correct for a Sem-III lab (no BTL5/6).

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MR22 – Revised Course Outcome
B.Tech. III Semester
Regulation: MR22 Year/Sem: II /I Department: IT

MC351HS: Gender Sensitization Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC351HS.1	**Analyze** gender concepts, social constructs, and their impact on contemporary society and workplace.	4	Analyzing	**Gender Concepts:** Social constructs, gender roles, stereotypes, workplace dynamics, social norms analysis
MC351HS.2	**Evaluate** gender-based discrimination, violence issues, and their societal implications across different contexts.	5	Evaluating	**Gender Issues:** Discrimination analysis, violence prevention, equality assessment, societal impact evaluation
MC351HS.3	**Recommend** gender-sensitive approaches and inclusive practices for professional and social environments.	5	Evaluating	**Sensitive Approaches:** Workplace equality, social inclusion, policy recommendations, inclusive practices development

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	2	-	3	3	3	3	2	-	2	-	-	-	2
CO2	-	-	-	2	-	3	3	3	3	2	-	2	-	-	-	3
CO3	-	-	-	3	-	3	3	3	3	3	-	3	-	-	-	3
Average	**–**	**–**	**–**	**2.33**	**–**	**3**	**3**	**3**	**3**	**2.33**	**–**	**2.33**	**–**	**–**	**–**	**2.67**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO6** - Societal gender issues & community impact. **PO7** - Environmental justice & sustainable equality. **PO8** - Ethical gender practices & social responsibility. **PO9** - Teamwork in diverse environments & inclusive collaboration. **PSO4** - Social research & inclusive innovation.
Moderate (2)	**PO4** - Social investigation & gender analysis. **PO10** - Communication in diverse settings & inclusive dialogue. **PO12** - Lifelong social learning & continuous sensitivity development.
Minor (1)	**PO1, PO2, PO3, PO5, PO11, PSO1, PSO2, PSO3** - Technical engineering aspects not directly related to gender sensitization curriculum.
No Mapping	**PO1, PO2, PO3, PO5, PO11, PSO1, PSO2, PSO3** - Beyond scope of social awareness laboratory.
Cognitive Range	**BTL 4–5** - High-level analysis and evaluation of gender concepts, social constructs, and inclusive practices, appropriate for social science laboratory with focus on critical thinking and recommendation development.

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MR22 – Revised Course Outcome
B.Tech. IV Semester
Regulation: MR22 Year/Sem: II /II Department: IT

CS401PC: Discrete Mathematics

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS401PC.1	**Apply** mathematical logic and inference theory to formulate and validate logical statements and arguments.	3	Applying	Unit I: Mathematical Logic
CS401PC.2	**Analyze** set theory concepts, relations, and functions to model discrete structures and their properties.	4	Analyzing	Unit II: Set Theory
CS401PC.3	**Evaluate** algebraic structures including semigroups, monoids, and lattices for their computational applications.	5	Evaluating	Unit III: Algebraic Structures
CS401PC.4	**Solve** combinatorial problems using counting principles, permutations, and binomial theorems.	3	Applying	Unit IV: Elementary Combinatorics
CS401PC.5	**Design** graph models and apply graph theory concepts to solve computing and network problems.	6	Creating	Unit V: Graph Theory

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	-	-	-	-	1	-	2	1	1	3	1
CO2	3	3	2	2	1	-	-	-	-	1	-	2	1	1	3	1
CO3	3	3	2	2	1	-	-	-	-	1	-	2	1	1	3	2
CO4	3	3	2	2	1	-	-	-	-	1	-	2	1	1	3	2
CO5	3	3	3	2	1	-	-	-	-	1	-	3	2	2	3	3
Average	**3**	**3**	**2.2**	**2**	**1**	**–**	**–**	**–**	**–**	**1**	**–**	**2.2**	**1.2**	**1.2**	**3**	**1.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Mathematical foundations for computing. **PO2** - Logical problem analysis & solving. **PSO3** - Mathematical concepts & discrete structures.
Moderate (2)	**PO3** - Algorithm design support. **PO4** - Mathematical investigation. **PO12** - Foundation for advanced computing.
Minor (1)	**PO5** - Basic computational tools. **PO10** - Mathematical communication. **PSO1** - Limited system connection. **PSO2** - Algorithmic thinking. **PSO4** - Research methodology.
No Mapping	**PO6, PO7, PO8, PO9, PO11** - Societal, environmental, ethical, teamwork & project management not covered.
Cognitive Range	**BTL 3–6** - Strong progression from logical application to advanced graph theory design and problem-solving.

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MR22 – Revised Course Outcome
B.Tech. IV Semester
Regulation: MR22 Year/Sem: II /II Department: IT
MS401HS: Business Economics and Financial Analysis

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MS401HS.1	**Analyze** the structure of business entities and the impact of macroeconomic concepts like inflation and business cycles on the business environment.	4	Analyzing	Unit-I: Introduction to Business and Economics
MS401HS.2	**Analyze** demand and supply dynamics, **apply** elasticity concepts for decision-making, and **evaluate** methods for demand forecasting.	4	Analyzing	Unit-II: Demand and Supply Analysis
MS401HS.3	**Apply** concepts of production, cost, and break-even analysis to solve problems and **evaluate** different market structures and pricing strategies.	3	Applying	Unit-III: Production, Cost, Market Structures & Pricing
MS401HS.4	**Prepare** books of accounts and final financial statements (Trading & P/L Account, Balance Sheet) incorporating necessary adjustments.	3	Applying	Unit-IV: Financial Accounting
MS401HS.5	**Evaluate** a company's financial health and operational efficiency by computing and **interpreting** various financial ratios.	5	Evaluating	Unit-V: Financial Analysis through Ratios

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	-	1	-	2	2	1	-	-	1	1	-	-	-	-
CO2	2	3	-	2	-	1	-	-	-	-	1	1	-	-	-	-
CO3	2	2	-	2	-	1	-	-	-	-	1	1	-	-	-	-
CO4	2	-	-	2	-	-	-	3	-	-	2	-	-	-	-	-
CO5	2	3	-	3	-	-	-	3	-	-	2	1	-	-	-	-
Average	**2**	**2**	**–**	**2**	**–**	**0.8**	**0.4**	**1.4**	**–**	**–**	**1.4**	**0.8**	**–**	**–**	**–**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis):** CO2 and CO5 require analyzing market forces and financial data to identify problems and opportunities. **PO4 (Investigation):** CO5 involves investigating financial statements through ratio analysis to draw conclusions. **PO8 (Ethics):** CO4 and CO5 are strongly linked to the ethical preparation and interpretation of financial records.
Moderate (2)	**PO1 (Engineering Knowledge):** Applies knowledge of economics and accounting principles to business scenarios. **PO11 (Project Management):** Concepts of cost analysis (CO3) and financial planning (CO5) are fundamental to project management. **PO12 (Life-long Learning):** The dynamic nature of business and economics necessitates continuous learning.
Minor (1)	**PO6 (The Engineer & Society):** CO1 considers the broader economic environment in which engineers operate. **PO7 (Environment & Sustainability):** CO1 indirectly touches upon sustainable development as a business goal.
No Mapping	**PO3 (Design/Development):** The course is analytical, not focused on designing solutions. **PO5 (Modern Tool Usage):** No software tools are specified in the syllabus. **PO9 (Individual & Team Work), PO10 (Communication):** Not explicitly assessed. **PSO1, PSO2, PSO3, PSO4:** This is a fundamental management course, not directly aligned with the program's technical computing outcomes.
Cognitive Range	**BTL Range (3-5):** The course effectively progresses from application (preparing statements, solving problems) to analysis (of markets, data) and evaluation (of financial health), which is appropriate for a fourth-semester student.

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MR22 – Revised Course Outcome
B.Tech. IV Semester
Regulation: MR22 Year/Sem: II /II Department: IT

CS402PC: Operating Systems

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS402PC.1	**Analyze** the structure, services, and system calls of different operating system types and **explain** process management concepts.	4	Analyzing	Unit-I: OS Introduction & Process
CS402PC.2	**Evaluate** and **compare** different CPU scheduling algorithms and **apply** methods for deadlock handling, avoidance, and detection.	5	Evaluating	Unit-II: CPU Scheduling & Deadlocks
CS402PC.3	**Design** solutions for process synchronization problems using semaphores and monitors and **analyze** inter-process communication mechanisms.	6	Creating	Unit-III: Process Synchronization & IPC
CS402PC.4	**Analyze** and **compare** various memory management and page replacement schemes used in operating systems.	4	Analyzing	Unit-IV: Memory Management & Virtual Memory
CS402PC.5	**Analyze** file system structures, allocation methods, and **apply** system calls for file operations.	4	Analyzing	Unit-V: File System Interface & Operations

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	1	3	1	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1	3	1	2	1
CO3	3	3	3	2	-	-	-	-	-	-	-	1	3	2	2	2
CO4	3	3	2	2	-	-	-	-	-	-	-	1	3	1	2	1
CO5	3	2	1	1	-	-	-	-	-	-	-	1	3	1	-	1
Average	**3**	**2.6**	**1.8**	**1.4**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**1**	**3**	**1.2**	**1.2**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** The entire course is built on the core knowledge base of computer science. **PSO1 (Foundation of Computer System):** The OS is a fundamental component of a computer system; this course provides a deep understanding of its internals.
Moderate (2)	**PO2 (Problem Analysis):** CO2, CO3, and CO4 require analyzing complex problems like deadlocks, synchronization, and memory allocation. **PO3 (Design/Development):** CO3 involves designing solutions for synchronization problems. **PO4 (Investigation):** CO2 and CO4 require investigating and comparing different algorithms. **PSO2 (Software Development):** Understanding OS concepts is crucial for developing efficient software. **PSO3 (Mathematical Concepts):** Algorithms for scheduling and memory management have a mathematical basis.
Minor (1)	**PO12 (Life-long Learning):** The rapidly evolving field of OS design requires an ability to learn new concepts. **PSO4 (Research Ability):** The analytical nature of the course lays a foundation for research in systems software.
No Mapping	**PO5 (Modern Tool Usage):** The theory course does not mandate tool usage. **PO6, PO7 (Society & Environment):** Not directly addressed. **PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management):** Not explicitly assessed in the theoretical context.
Cognitive Range	**BTL Range (4-6):** The course is heavily skewed towards analysis, evaluation, and creation (design), which is excellent and exceeds the typical Year 2 target, indicating a rigorous curriculum that prepares students well for advanced topics.

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MR22 – Revised Course Outcome
B.Tech. IV Semester
Regulation: MR22 **Year/Sem: II /II** **Department: IT**

CS404PC: Database Management Systems

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS404PC.1	**Design** a database schema for a given application by **constructing** an Entity-Relationship (ER) model and **translating** it into a relational model.	6	Creating	Unit-I: Database Design & ER Model
CS404PC.2	**Apply** relational algebra and calculus operations to query databases and **enforce** data integrity using constraints.	3	Applying	Unit-II: Relational Model & Algebra
CS404PC.3	**Construct** complex SQL queries for data manipulation and **apply** schema refinement through normalization up to BCNF and 4NF.	3	Applying	Unit-III: SQL & Schema Refinement
CS404PC.4	**Analyze** transaction processing concepts, concurrency control protocols, and recovery techniques to ensure database consistency and durability.	4	Analyzing	Unit-IV: Transaction Processing
CS404PC.5	**Evaluate** and **compare** different file organizations and indexing structures for efficient data storage and retrieval.	5	Evaluating	Unit-V: Storage & Indexing

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	1	-	-	-	-	-	-	-	1	2	3	2	1
CO2	3	2	2	-	-	-	-	-	-	-	-	1	1	2	3	-
CO3	3	2	2	1	-	-	-	-	-	-	-	1	1	3	2	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	3	2	1	1
CO5	3	3	2	2	-	-	-	-	-	-	-	1	3	1	1	1
Average	**3**	**2.4**	**2.2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2.2**	**1.8**	**0.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** The course is foundational to the IT discipline. **PSO2 (Foundations of Software Development):** Database design and SQL are core skills for any software developer.
Moderate (2)	**PO2 (Problem Analysis):** CO1, CO4, and CO5 require analyzing requirements and performance problems. **PO3 (Design/Development):** CO1 involves designing database schemas, a key development activity. **PSO1 (Computer System):** Storage and indexing (CO5) are key system-level concepts. **PSO3 (Mathematical Concepts):** Relational algebra (CO2) and normalization (CO3) are based on set theory and logic.
Minor (1)	**PO4 (Investigation):** CO4 and CO5 involve investigating transaction and storage performance. **PO12 (Life-long Learning):** The field of data management is constantly evolving. **PSO4 (Research Ability):** The course provides a foundation for research in data management systems.
No Mapping	**PO5 (Modern Tool Usage):** The theory course does not mandate a specific DBMS tool. **PO6, PO7 (Society & Environment):** Not directly addressed. **PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management):** Not explicitly assessed in the theoretical context.
Cognitive Range	**BTL Range (3-6):** The course provides a balanced mix of application (SQL, Algebra), analysis (transactions), evaluation (indexing), and creation (schema design). This aligns well with a fourth-semester course, building strong foundational skills.

MR22 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR22 **Year/Sem: II /II** **Department: IT**

IT401PC: Java Programming

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT401PC.1	**Apply** Object-Oriented Programming principles (Encapsulation, Inheritance, Polymorphism, Abstraction) to **design** solutions for real-world problems.	3	Applying	Unit-I: Foundations & OOP Principles
IT401PC.2	**Develop** robust applications by **implementing** exception handling mechanisms and **performing** file operations using I/O streams.	3	Applying	Unit-II: Exception Handling & Files I/O
IT401PC.3	**Utilize** Java packages and the Collections Framework to **organize** code and **manage** data efficiently.	3	Applying	Unit-III: Packages & Collections
IT401PC.4	**Design** and **implement** multithreaded applications with synchronization and **integrate** Java applications with databases using JDBC.	6	Creating	Unit-IV: Multithreading & JDBC
IT401PC.5	**Design** event-driven Graphical User Interfaces (GUIs) using Swing components and the delegation event model.	6	Creating	Unit-V: GUI Programming & Event Handling

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	1	-	-	-	-	-	-	1	2	3	-	1
CO2	3	2	2	-	1	-	-	-	-	-	-	1	1	3	-	1
CO3	3	2	2	-	1	-	-	-	-	-	-	1	1	3	-	1
CO4	3	3	3	1	2	-	-	-	-	-	-	2	2	3	-	2
CO5	3	2	3	1	2	-	-	-	-	-	-	2	1	3	-	2
Average	**3**	**2.2**	**2.4**	**0.4**	**1.4**	**–**	**–**	**–**	**–**	**–**	**–**	**1.4**	**1.4**	**3**	**–**	**1.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** The course imparts core programming knowledge in a modern OOP language. **PSO2 (Foundations of Software Development):** Java is a primary language for software development; this course directly builds strong development foundations.
Moderate (2)	**PO2 (Problem Analysis):** CO1, CO4, and CO5 require analyzing problems to apply OOP and design GUI/threaded solutions. **PO3 (Design/Development):** CO4 and CO5 explicitly involve the design and development of multithreaded and GUI applications. **PO12 (Life-long Learning):** Learning a programming language fosters the skill of adapting to new technologies.
Minor (1)	**PO5 (Modern Tool Usage):** The course involves using the Java programming environment (JDK). **PO4 (Investigation):** Debugging code requires investigation of errors. **PSO1 (Computer System):** Multithreading (CO4) relates to how software utilizes system resources. **PSO4 (Research Ability):** Provides the skill to implement software for research prototypes.
No Mapping	**PO6, PO7 (Society & Environment):** Not directly addressed. **PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management):** Not explicitly assessed in the theoretical context. **PSO3 (Mathematical Concepts):** No direct mapping to mathematical theory.
Cognitive Range	**BTL Range (3, 6):** The course is polarized between application (using OOP, exceptions, collections) and creation (designing multithreaded and GUI systems). The high proportion of creation (BTL-6) is significant and indicates a strong focus on design and implementation skills.

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MR22 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR22 **Year/Sem: II /II** **Department: IT**

CS451PC: Operating Systems Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS451PC.1	**Simulate** and **analyze** CPU scheduling and memory management algorithms to **evaluate** their performance characteristics.	4	Analyzing	CPU Scheduling (Exp 1), Memory Management (Exp 6, 7)
CS451PC.2	**Implement** solutions for inter-process communication and classical synchronization problems using Unix/Linux system calls and semaphores.	3	Applying	IPC Mechanisms (Exp 5), Producer-Consumer (Exp 4)
CS451PC.3	**Develop** C programs **utilizing** Unix/Linux system calls for file I/O and process management and **implement** solutions for deadlock avoidance.	3	Applying	Unix System Calls (Exp 2), Deadlock Avoidance (Exp 3)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	-	-	-	1	3	1	2	1
CO2	3	2	2	1	3	-	-	-	-	-	-	1	3	2	1	1
CO3	3	2	2	1	3	-	-	-	-	-	-	1	3	2	1	1
Average	**3**	**2.33**	**2**	**1.33**	**3**	**–**	**–**	**–**	**–**	**–**	**–**	**1**	**3**	**1.67**	**1.33**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** Direct application of core OS concepts. **PO5 (Modern Tool Usage):** Use of Linux OS, GCC compiler, and system call interfaces. **PSO1 (Foundation of Computer System):** Hands-on experimentation with the core components of an OS.
Moderate (2)	**PO2 (Problem Analysis):** Analyzing which algorithm or synchronization method is suitable. **PO3 (Design/Development):** Designing and coding solutions for synchronization and IPC.
Minor (1)	**PO4 (Investigation):** Investigating the behavior of algorithms through simulation. **PO12 (Life-long Learning):** Skills to work with and understand system-level software. **PSO2 (Software Development):** Develops low-level system programming skills. **PSO4 (Research Ability):** Provides a platform to experiment with and compare core algorithms.
No Mapping	**PO6, PO7 (Society & Environment):** Not directly addressed. **PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management):** Typically not the focus of a core technical lab.
Cognitive Range	**BTL Range (3-4):** The lab focuses on **Applying** (implementing algorithms, using system calls) and **Analyzing** (comparing algorithm performance), which is appropriate and practical for reinforcing theoretical concepts from the OS course.

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MR22 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR22 **Year/Sem: II /II** **Department: IT**

CS452PC: Database Management Systems Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage
CS452PC.1	**Design** and **implement** a normalized database schema for a given problem statement by **constructing** an E-R model and **defining** relational tables.	6	Creating	Concept Design, Relational Model, Normalization (Exp 1, 2, 3)
CS452PC.2	**Construct** and **execute** complex SQL queries using DDL, DML, subqueries, joins, and views to **manipulate** and **retrieve** data efficiently.	3	Applying	DDL, DML, Querying, Views (Exp 4, 5, 6, 7)
CS452PC.3	**Develop** programmable database objects like triggers, procedures, and cursors to **implement** business logic and **automate** database operations.	3	Applying	Triggers, Procedures, Cursors (Exp 8, 9, 10)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03	PS04
CO1	3	3	3	2	3	-	-	-	-	-	-	2	2	3	2	1
CO2	3	2	2	1	3	-	-	-	-	-	-	1	1	3	2	-
CO3	3	2	2	1	3	-	-	-	-	-	-	1	1	3	1	-
Average	**3**	**2.33**	**2.33**	**1.33**	**3**	**–**	**–**	**–**	**–**	**–**	**–**	**1.33**	**1.33**	**3**	**1.67**	**0.33**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** Applies core database concepts. **PO5 (Modern Tool Usage):** Use of a specific DBMS (e.g., Oracle, MySQL). **PSO2 (Foundations of Software Development):** Database design and SQL are fundamental software development skills.
Moderate (2)	**PO2 (Problem Analysis):** Analyzing requirements to design a schema. **PO3 (Design/Development):** Designing the database schema and programable objects.
Minor (1)	**PO4 (Investigation):** Testing and debugging queries and procedures. **PO12 (Life-long Learning):** Ability to learn new database technologies. **PSO1 (Computer System):** Understanding how data is stored and managed. **PSO4 (Research Ability):** Ability to structure and manage data for research.
No Mapping	**PO6, PO7 (Society & Environment):** Not directly addressed. **PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management):** Not the primary focus of this technical lab.
Cognitive Range	**BTL Range (3, 6):** The lab effectively combines the high-level skill of **Creating** a database design with the practical skill of **Applying** SQL and PL/SQL. This blend is ideal for translating theoretical knowledge into implementable solutions.

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MR22 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR22 **Year/Sem: II /II** **Department: IT**

CS453PC: Java Programming Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
JAVALAB.1	**Apply** object-oriented programming principles in Java by **using** classes, objects, encapsulation, inheritance, polymorphism, abstraction, and IDE features such as code completion, refactoring, and debugging.	3	Applying	Exp 1 (IDE, debugging), Exp 2 (OOP concepts)
JAVALAB.2	**Analyze** and **implement** robust Java applications using exception handling, file handling, collections, multithreading, and JDBC for data-centric and concurrent operations.	4	Analyzing	Exp 3 (exceptions), Exp 4 (RandomAccessFile), Exp 5 (collections), Exp 6 (threads), Exp 7 (JDBC)
JAVALAB.3	**Develop** interactive Java applications with graphical user interfaces and event handling to manage user input, perform computations, and respond to mouse and component events.	3	Applying	Exp 8 (calculator GUI), Exp 9 (mouse events & adapter classes)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	–	–	–	–	2	–	–	–	3	3	–
CO2	3	3	3	3	3	–	–	–	–	2	–	–	–	3	3	–
CO3	3	3	2	2	3	–	–	–	–	2	–	–	–	3	3	–
Average	**3.0**	**3.0**	**2.3**	**2.3**	**3.0**	–	–	–	–	**2.0**	–	–	–	**3.0**	**3.0**	–

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1–PO5:** Strongly supported through OOP concepts, debugging, file handling, collections, multithreading, and JDBC. **PSO2 & PSO3:** Strong mapping due to core software development and algorithmic thinking in Java.
Moderate (2)	**PO10:** Moderate support through documentation, explaining code, writing outputs, and error reports.
Minor (1)	*(None required for this lab as no weak mappings are meaningful.)*
No Mapping	**PO6–PO9, PO11, PO12, PSO1, PSO4:** Java Lab does not involve ethics, environment, society, teamwork, project management, lifelong learning, hardware foundations, or research-driven activities.
Cognitive Range	CO1 → BTL3, CO2 → BTL4, CO3 → BTL3. Fully aligned with Lab requirements (BTL 3–4 only).

MR22 – Revised Course Outcome
B.Tech. IV Semester
Regulation: MR22 **Year/Sem: II /II** **Department: IT**

CS454PC: Node JS/ React JS/Django

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Themes
CS454PC.1	**Develop** responsive and interactive front-end web applications **using** HTML, CSS, Bootstrap, and advanced JavaScript (ES6+) features.	3	Applying	Front-end Development (Exp 1, 2, 3, 4)
CS454PC.2	**Design** and **implement** server-side components and RESTful APIs using Node.js and Express.js, **integrating** with databases and **implementing** authentication.	6	Creating	Back-end Development (Exp 9, 10, 11)
CS454PC.3	**Build** and **deploy** single-page applications (SPAs) using the React framework, **implementing** routing and **consuming** data from APIs.	6	Creating	Front-end Framework (Exp 12, 13, 14)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1	3	-	-	-	-	-	-	1	1	3	-	1
CO2	3	3	3	2	3	-	-	-	-	-	-	2	2	3	-	2
CO3	3	2	3	1	3	-	-	-	-	-	-	2	1	3	-	2
Average	**3**	**2.33**	**2.67**	**1.33**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1.67**	**1.33**	**3**	**-**	**1.67**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** Applies modern web development concepts. **PO5 (Modern Tool Usage):** Use of multiple modern frameworks and tools (Node, React, Express). **PSO2 (Foundations of Software Development):** Directly builds full-stack web development skills, a core IT competency.
Moderate (2)	**PO3 (Design/Development):** Designing application architecture and UI/UX. **PO2 (Problem Analysis):** Analyzing requirements to choose appropriate front-end/back-end solutions.
Minor (1)	**PO4 (Investigation):** Debugging and testing across the full stack. **PO12 (Life-long Learning):** The fast-paced nature of web development requires constant learning. **PSO4 (Research Ability):** Ability to build web-based prototypes and applications.
No Mapping	**PO6, PO7 (Society & Environment):** Not directly addressed. **PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management):** Not the primary focus. **PSO1 (Computer System), PSO3 (Mathematical Concepts):** No direct mapping.
Cognitive Range	**BTL Range (3, 6):** The lab moves from **Applying** fundamental web technologies to **Creating** complex server-side APIs and single-page applications. This high BTL level is appropriate for a course that aims to produce industry-ready full-stack developers.

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MR22 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR22 **Year/Sem: II /II** **Department: IT**

IT451PC: Real-time Research Project / Societal Related Project

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT451PC.1	**Analyze** a real-world or societal problem, **investigate** existing solutions, and **formulate** a software-based project proposal with clear objectives.	4	Analyzing	Problem Identification, Literature Review, Proposal Writing
IT451PC.2	**Design** and **develop** a complete software solution by **applying** engineering principles, modern tools, and appropriate methodologies.	6	Creating	System Design, Coding, Integration, Testing
IT451PC.3	**Demonstrate** project management, collaboration, and communication skills through documentation, presentations, and teamwork.	3	Applying	Project Planning, Teamwork, Documentation, Presentation

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	2	2	1	1	2	1	2	2	2	1	3
CO2	3	3	3	2	3	1	1	1	2	1	2	2	2	3	1	3
CO3	1	1	1	1	1	1	1	2	3	3	3	2	1	1	-	1
Average	**2**	**2.33**	**2**	**2**	**2**	**1.33**	**1.33**	**1.33**	**2**	**2**	**2**	**2**	**1.67**	**2**	**0.67**	**2.33**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis):** CO1 requires deep analysis of a problem domain. **PO3 (Design/Development):** CO2 is the core of designing and building the solution. **PSO4 (Applications of Computing & Research Ability):** The entire project is an application of computing, and a research-oriented project directly fulfills this.
Moderate (2)	**PO1 (Engineering Knowledge):** Application of knowledge from various courses. **PO4 (Investigation):** Literature survey and analysis in CO1., **PO5 (Modern Tool Usage):** Using software development tools., **PO9 (Individual & Team Work):** Inherent in project work (CO3)., **PO10 (Communication):** Documentation and presentation (CO3). **PO11 (Project Management):** Planning and execution (CO3)., **PO12 (Life-long Learning):** Self-learning new technologies for the project., **PSO2 (Software Development):** The primary activity is software development.
Minor (1)	**PO6 (The Engineer & Society):** Societally relevant projects. **PO7 (Environment & Sustainability):** Projects related to environmental monitoring, etc. **PO8 (Ethics):** Ethical conduct in project execution. **PSO1 (Computer System):** If the project involves system-level programming.
No Mapping	**PSO3 (Mathematical Concepts):** Not a direct focus unless the project is algorithm-intensive.
Cognitive Range	**BTL Range (3-6):** This project course perfectly encapsulates the progression from **Analyzing** a problem, through **Applying** project management skills, to **Creating** a novel solution. This holistic high-order cognitive engagement is the ultimate goal of engineering education.

MR22 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR22 **Year/Sem: II /II** **Department: IT**

MC401HS: Constitution of India

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC401HS.1	**Explain** the historical context and philosophical foundations of the Indian Constitution, including the significance of its Preamble and salient features.	2	Understanding	Unit-I & II: History & Philosophy
MC401HS.2	**Describe** the Fundamental Rights, Duties of citizens, and the Directive Principles of State Policy outlined in the Constitution.	2	Understanding	Unit-III: Constitutional Rights & Duties
MC401HS.3	**Outline** the structure, roles, and functions of the Union and State governance organs: Parliament, Executive, and Judiciary.	2	Understanding	Unit-IV: Organs of Governance
MC401HS.4	**Explain** the structure and importance of Local Self-Governance (Panchayati Raj and Municipalities) in India's democratic framework.	2	Understanding	Unit-V: Local Administration
MC401HS.5	**Describe** the role of constitutional bodies like the Election Commission and institutions for the welfare of SC/ST/OBC and women.	2	Understanding	Unit-VI: Election Commission & Welfare Bodies

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03	PS04
CO1	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-	-
CO2	-	-	-	-	-	2	-	3	1	-	-	1	-	-	-	-
CO3	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-	-
CO4	-	-	-	-	-	3	-	2	-	-	-	1	-	-	-	-
CO5	-	-	-	-	-	3	-	3	-	-	-	1	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**2.4**	**-**	**2.4**	**0.2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO6 (The Engineer & Society):** The entire course explains the constitutional framework that governs Indian society, enabling engineers to understand their role and responsibilities within it. (CO4, CO5). **PO8 (Ethics):** The chapters on Fundamental Rights, Duties, and the roles of various bodies instill an understanding of constitutional morality, ethical conduct, and social justice (CO2, CO5).
Moderate (2)	*This level is fully covered by the Major Contributions in this case.*
Minor (1)	**PO9 (Individual & Team Work):** Understanding rights and duties fosters responsible citizenship, which underpins effective teamwork (CO2). **PO12 (Life-long Learning):** Creates a foundation for being an informed and engaged citizen throughout life.
No Mapping	**PO1, PO2, PO3, PO4, PO5, PO7, PO10, PO11:** These are technical and engineering management POs with no direct correlation to the content of this humanities/social science course. **PSO1, PSO2, PSO3, PSO4:** These are program-specific technical outcomes with no direct mapping.
Cognitive Range	**BTL Range (2):** As a fundamental awareness course, the cognitive level is appropriately at **Understanding**. The goal is to ensure students comprehend the structure and principles of the Indian Constitution, not to apply, analyze, or create with this knowledge in an engineering context.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

IT501PC: Software Engineering

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
ITS01PC.1	**Explain** various software process models and frameworks to select an appropriate model for a given project context.	2	Understand	Unit I
ITS01PC.2	**Analyze** user needs to formulate software requirements and develop a Software Requirements Specification (SRS) document.	4	Analyze	Unit II
ITS01PC.3	**Create** architectural and detailed design models using UML diagrams to translate software requirements into a high-level design.	6	Create	Unit III
ITS01PC.4	**Develop** comprehensive test strategies and cases by applying appropriate testing methods to validate and verify software quality.	3	Apply	Unit IV
ITS01PC.5	**Evaluate** software projects to identify risks, assess quality, and propose mitigation strategies following standard quality paradigms.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	1	1	2	1	-	-
CO2	2	3	2	1	-	-	-	-	-	-	1	1	2	2	-	-
CO3	2	2	3	-	2	-	-	-	1	1	1	1	2	3	-	-
CO4	2	2	2	2	2	-	-	-	1	-	1	1	2	3	-	-
CO5	2	3	2	2	-	1	1	2	1	-	2	2	1	2	-	1
Average	**2.2**	**2.4**	**2**	**1**	**0.8**	**0.2**	**0.2**	**0.4**	**0.6**	**0.2**	**1.2**	**1.2**	**1.8**	**2.2**	**–**	**0.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2** - Core analysis of requirements, risks, and project contexts (COs 2,5) **PSO2** - Entire course covers software development foundations from process to quality
Moderate (2)	**PO1** - Applies engineering fundamentals to software processes **PO3** - Direct design work (CO3) supported by requirements and testing phases **PO4** - Investigation through requirement analysis and risk assessment
Minor (1)	**PO5** - Implied use of UML tools and testing frameworks **PO11** - Basic project management via process models and risk management **PO12** - Evolving nature of SE requires continuous learning **PSO1** - Relates software processes to computer systems
No Mapping	**PO6, PO7, PO8** - Societal, environmental, ethical aspects not covered **PO9, PO10** - Teamwork and communication not explicitly evaluated **PSO3** - Not mathematically intensive **PSO4** - Focuses on established practices, not research
Cognitive Range	**BTL 2-6** - Strong HOTS focus (40%) appropriate for Year 3. Progresses from understanding concepts to creating designs and evaluating risks/quality.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

IT502PC: Data Communications and Computer Networks

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
ITS02PC.1	**Explain** the fundamental concepts of data communication, network models (OSI, TCP/IP), and physical layer components including transmission media and switching techniques.	2	Understand	Unit I
ITS02PC.2	**Analyze** data link layer functionalities including framing, error control, flow control, and medium access control protocols to solve network communication problems.	4	Analyze	Unit II
ITS02PC.3	**Design** logical addressing schemes and **evaluate** routing protocols for efficient packet forwarding in network layer operations.	5	Evaluate	Unit III
ITS02PC.4	**Implement** transport layer protocols (UDP, TCP) and congestion control mechanisms to ensure reliable process-to-process data delivery.	3	Apply	Unit IV
ITS02PC.5	**Configure** application layer services including DNS, SMTP, FTP, and HTTP to support network applications and web services.	3	Apply	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	1	3	1	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	1	3	1	2	-
CO3	2	3	3	2	1	-	-	-	-	-	-	1	3	2	2	-
CO4	2	2	2	1	2	-	-	-	-	-	-	1	2	2	2	-
CO5	2	2	2	1	3	-	-	-	-	-	-	1	2	2	1	-
Average	**2.4**	**2.4**	**2**	**1.2**	**1.2**	**–**	**–**	**–**	**–**	**–**	**–**	**1**	**2.6**	**1.6**	**1.4**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1/PSO1** - Strong engineering knowledge in network architectures, protocols, and communication fundamentals (All COs)
Moderate (2)	**PO2** - Analysis of network problems and protocol evaluation (COs 2,3), **PO3** - Design of addressing schemes and network solutions (CO3)
Minor (1)	**PO4** - Investigation of protocol behaviors and network issues, **PO5** - Use of network simulation/configuration tools, **PO12** - Keeping updated with evolving network technologies **PSO2** - Foundation for network-based software, **PSO3** - Mathematical basis for routing and error control
No Mapping	**PO6, PO7** - No societal/environmental focus, **PO8** - Ethics not explicitly covered **PO9, PO10** - Individual technical focus, **PO11** - Project management not addressed **PSO4** - Research aspects not included
Cognitive Range	**BTL 2-5** - Balanced distribution (L:20%, M:60%, H:20%) suitable for Year 3. Focus on applying and analyzing network concepts with some evaluation.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

CM502PC: Machine Learning

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CM502PC.1	**Apply** dimensionality reduction techniques and statistical measures to **preprocess** and **analyze** datasets for machine learning applications.	3	Apply	Unit I
CM502PC.2	**Implement** supervised learning algorithms including decision trees and instance-based methods to **solve** classification and regression problems.	3	Apply	Unit II
CM502PC.3	**Design** neural network architectures using perceptron and backpropagation algorithms to **develop** pattern recognition systems.	6	Create	Unit III
CM502PC.4	**Evaluate** Bayesian learning methods and support vector machines to **select** appropriate probabilistic models for given learning tasks.	5	Evaluate	Unit IV
CM502PC.5	**Compare** unsupervised learning techniques including clustering and ensemble methods to **analyze** unlabeled datasets.	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2	-	-	-	-	-	-	1	2	2	3	1
CO2	3	3	3	2	3	-	-	-	-	-	-	1	2	3	3	1
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	3	2	2
CO4	3	3	2	2	2	-	-	-	-	-	-	1	2	2	3	1
CO5	3	3	2	2	2	-	-	-	-	-	-	1	2	2	3	1
Average	**3**	**2.8**	**2.4**	**2**	**2.4**	**–**	**–**	**–**	**–**	**–**	**–**	**1.2**	**2**	**2.4**	**2.8**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Strong mathematical and algorithmic foundations (All COs) **PSO3/PSO4** - Advanced mathematical modeling and research applications (COs 1,4,5)
Moderate (2)	**PO2** - Analysis of learning problems and model selection (COs 4,5) **PO3** - Design of ML solutions and architectures (CO3) **PO5** - Implementation using ML tools and libraries
Minor (1)	**PO4** - Experimental investigation of model performance **PO12** - Rapidly evolving field requires continuous learning **PSO1** - Computational intelligence foundations **PSO2** - Software development using ML components
No Mapping	**PO6, PO7** - No societal/environmental focus **PO8** - Ethics of AI not covered **PO9, PO10** - Individual technical work **PO11** - Project management not included
Cognitive Range	**BTL 3-6** - Strong practical focus (L:0%, M:60%, H:40%) exceeds Year 3 targets. Emphasis on implementing, evaluating, and creating ML solutions.

MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

MC501ES: Cyber Security

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC501ES.1	**Analyze** cyber security threats and attacks to **implement** appropriate defense mechanisms and security models for organizational protection.	4	Analyze	Unit I
MC501ES.2	**Evaluate** cyber laws and digital forensics procedures to **assess** legal compliance in cybersecurity incidents and investigations.	5	Evaluate	Unit II
MC501ES.3	**Identify** security vulnerabilities in mobile and wireless systems to **recommend** appropriate security measures and policies.	4	Analyze	Unit III
MC501ES.4	**Assess** organizational implications of cybercrimes to **develop** effective security strategies and privacy protection measures.	5	Evaluate	Unit IV
MC501ES.5	**Apply** privacy principles and data protection techniques to **solve** real-world cybersecurity challenges through case studies.	3	Apply	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	1	-	2	-	-	1	1	3	2	-	1
CO2	2	2	1	2	1	2	-	3	-	1	1	2	2	1	-	2
CO3	3	3	2	2	2	1	-	2	-	-	1	1	3	2	-	1
CO4	2	2	2	2	1	2	-	3	1	1	2	2	2	2	-	2
CO5	2	2	2	2	2	2	-	3	-	1	1	1	2	2	-	2
Average	**2.4**	**2.4**	**1.8**	**2**	**1.6**	**1.6**	**–**	**2.6**	**0.2**	**0.6**	**1.2**	**1.4**	**2.4**	**1.8**	**–**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO8** - Strong focus on cybersecurity ethics and legal compliance (COs 2,4,5). **PSO1** - Core security principles and system protection mechanisms (COs 1,3)
Moderate (2)	**PO1/PO2** - Technical knowledge and analysis of security threats (All COs), **PO4** - Investigation of security incidents and forensic analysis (COs 2,4), **PO6** - Societal impact of cybercrimes and protection measures (COs 2,4)
Minor (1)	**PO5** - Security tools and forensic software usage, **PO10** - Documentation of security policies and incidents, **PO11** - Security project management aspects, **PO12** - Evolving nature of cyber threats, **PSO2** - Secure software development principles, **PSO4** - Research in cybersecurity domains
No Mapping	**PO3** - Limited design/development focus, **PO7** - Environmental aspects not covered **PO9** - Individual analysis focus, **PSO3** - Mathematical foundations not emphasized
Cognitive Range	**BTL 3-5** - High analytical focus (L:0%, M:60%, H:40%) suitable for cybersecurity. Emphasis on evaluating threats and applying security solutions.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

MC501HS: Intellectual Property Rights

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC501HS.1	**Explain** the fundamental concepts of intellectual property rights and international frameworks to **understand** their significance in global business.	2	Understand	Unit I
MC501HS.2	**Analyze** trademark registration processes and infringement cases to **evaluate** brand protection strategies.	4	Analyze	Unit II
MC501HS.3	**Evaluate** copyright laws and ownership rights to **assess** legal compliance in creative works and digital content.	5	Evaluate	Unit III
MC501HS.4	**Apply** patent registration procedures to **develop** strategies for protecting inventions and technological innovations.	3	Apply	Unit IV
MC501HS.5	**Formulate** trade secret protection measures to **create** comprehensive IP management frameworks for organizations.	6	Create	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	-	2	1	3	1	2	2	3	1	1	-	2
CO2	1	2	1	2	-	2	1	3	1	2	2	3	1	1	-	2
CO3	1	2	1	2	-	2	1	3	1	2	2	3	1	1	-	2
CO4	2	2	2	2	-	2	1	3	1	2	2	3	2	2	-	2
CO5	2	2	2	2	-	2	1	3	2	2	3	3	2	2	-	2
Average	**1.4**	**1.8**	**1.4**	**1.8**	**–**	**2**	**1**	**3**	**1.2**	**2**	**2.2**	**3**	**1.4**	**1.4**	**–**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO8** - Core focus on IP ethics, legal compliance, and professional responsibility (All COs) **PO12** - Lifelong learning essential in evolving IP laws and international treaties (All COs)
Moderate (2)	**PO6** - Societal impact of IP protection and knowledge sharing (COs 1-5), **PO10** - Communication of IP rights and legal documentation (All COs), **PO11** - IP portfolio management and strategy development (COs 2,4,5)
Minor (1)	**PO1/PO2** - Basic engineering knowledge application in IP context, **PO3** - Design protection aspects, **PO4** - Investigation of IP infringements, **PO7** - Sustainable innovation protection **PO9** - Teamwork in IP management, **PSO1/PSO2** - IP aspects in computing systems **PSO4** - Research and innovation protection
No Mapping	**PO5** - Modern tool usage not emphasized **PSO3** - Mathematical concepts not relevant
Cognitive Range	**BTL 2-6** - Comprehensive range (L:20%, M:40%, H:40%) suitable for professional course. Balances understanding with creation of IP strategies.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

IT551PC: Software Engineering & Computer Networks Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT551PC.1	**Develop** software engineering documentation and **design** system models using CASE tools for real-world problem scenarios.	6	Create	Software Engineering Lab (Expts 1-5)
IT551PC.2	**Evaluate** software quality through comprehensive testing strategies and **validate** system functionality using various testing techniques.	5	Evaluate	Software Engineering Lab (Expts 6-7)
IT551PC.3	**Implement** data link layer protocols and network algorithms to **analyze** communication system performance and error handling.	3	Apply	Computer Networks Lab (Expts 1-4)
IT551PC.4	**Design** routing protocols and congestion control mechanisms to **optimize** network performance and information flow.	6	Create	Computer Networks Lab (Expts 5-7)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03	PS04
CO1	2	2	3	2	3	-	-	-	2	2	2	1	2	3	1	1
CO2	2	3	2	3	2	-	-	-	1	1	1	1	2	3	1	1
CO3	3	3	2	2	3	-	-	-	2	1	1	1	3	2	2	1
CO4	3	3	3	2	3	-	-	-	2	2	2	1	3	2	2	1
Average	**2.5**	**2.8**	**2.5**	**2.3**	**2.8**	**-**	**-**	**-**	**1.8**	**1.5**	**1.5**	**1**	**2.5**	**2.5**	**1.5**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2** - Strong problem analysis in both software and network domains (All COs) **PO5** - Extensive use of modern tools (CASE tools, network simulators, testing frameworks) **PSO1/PSO2** - Core software and network system implementation skills
Moderate (2)	**PO1** - Engineering knowledge application in practical scenarios, **PO3** - Design and development of software and network solutions, **PO4** - Investigation through testing and performance analysis, **PO9** - Teamwork in lab projects and collaborative tasks
Minor (1)	**PO10** - Documentation and report writing, **PO11** - Project planning in lab exercises **PO12** - Learning new tools and techniques, **PSO3** - Mathematical analysis in network algorithms, **PSO4** - Applied research in implementations
No Mapping	**PO6, PO7** - No societal/environmental focus in lab exercises **PO8** - Ethics not explicitly covered in lab manual
Cognitive Range	**BTL 3-6** - High practical application focus (L:0%, M:25%, H:75%) appropriate for lab course. Strong emphasis on creating and evaluating implementations.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

CM551PC: Machine Learning Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CM551PC.1	**Implement** statistical analysis and data preprocessing techniques using Python libraries to **prepare** datasets for machine learning applications.	3	Apply	Data Analysis & Preprocessing (Expts 1-4)
CM551PC.2	**Develop** supervised and unsupervised learning models including regression, classification, and clustering algorithms to **solve** real-world prediction problems.	6	Create	Model Development & Implementation (Expts 5-9)
CM551PC.3	**Evaluate** and **compare** the performance of various machine learning algorithms to **select** optimal models for specific applications through comprehensive analysis.	5	Evaluate	Performance Analysis & Mini Project (Expt 10)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	-	1	1	1	1	2	2	3	2
CO2	3	3	3	2	3	-	-	-	2	1	1	2	2	3	3	2
CO3	3	3	2	3	3	-	-	-	2	2	2	2	2	3	3	3
Average	**3.0**	**2.7**	**2.3**	**2.3**	**3.0**	**-**	**-**	**-**	**1.7**	**1.3**	**1.3**	**1.7**	**2.0**	**2.7**	**3.0**	**2.3**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Strong mathematical and algorithmic implementation in ML **PO5** - Extensive use of Python ML libraries (Pandas, Scikit-learn, Matplotlib) **PSO3** - Advanced mathematical modeling and statistical analysis
Moderate (2)	**PO2** - Analysis of data patterns and model performance **PO3** - Design and development of ML solutions **PO4** - Experimental investigation of algorithm performance **PO12** - Continuous learning in evolving ML field **PSO2** - Software development with ML components
Minor (1)	**PO9** - Collaborative work in mini-projects **PO10** - Documentation and result presentation **PO11** - Project management in ML applications **PSO1** - Computational intelligence implementation **PSO4** - Applied research in ML domains
No Mapping	**PO6, PO7, PO8** - No societal/environmental/ethical focus
Cognitive Range	**BTL 3-6** - Advanced practical implementation (L:0%, M:33%, H:67%) perfect for ML lab. Heavy emphasis on creating models and evaluating performance.

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MR22 – Revised Course Outcome
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CS553PC: UI design- Flutter

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS553PC.1	**Implement** Flutter widgets and responsive layout structures to **develop** cross-platform user interfaces for mobile applications.	3	Apply	UI Fundamentals & Layouts (Expts 1-3)
CS553PC.2	**Design** interactive applications with navigation, state management, and custom widgets to **create** seamless user experiences and dynamic forms.	6	Create	Navigation & Advanced Features (Expts 4-7)
CS553PC.3	**Develop** and **evaluate** complete Flutter applications with animations, API integration, and testing to **build** production-ready mobile solutions.	6	Create	Complete Application Development (Expts 8-10)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	1	3	-	-	-	1	1	1	1	2	3	1	1
CO2	2	2	3	1	3	-	-	-	2	2	2	2	2	3	1	2
CO3	2	3	3	2	3	-	-	-	2	2	2	2	2	3	1	2
Average	**2.0**	**2.3**	**3.0**	**1.3**	**3.0**	**-**	**-**	**-**	**1.7**	**1.7**	**1.7**	**1.7**	**2.0**	**3.0**	**1.0**	**1.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO3** - Design and development of user interfaces and mobile applications **PO5** - Extensive use of Flutter framework and Dart programming tools **PSO2** - Core software development skills in mobile application development
Moderate (2)	**PO2** - Problem analysis in UI/UX design challenges, **PO12** - Learning new mobile development technologies, **PSO4** - Applied research in mobile technologies
Minor (1)	**PO1** - Basic engineering principles in software design **PO4** - Investigation of UI issues and performance optimization **PO9** - Collaborative development in projects **PO10** - Documentation and presentation skills **PO11** - Project management in app development **PSO1** - Software system implementation **PSO3** - Basic mathematical concepts in layouts
No Mapping	**PO6, PO7, PO8** - No societal/environmental/ethical considerations
Cognitive Range	**BTL 3-6** - Strong practical implementation focus (L:0%, M:33%, H:67%) ideal for UI/UX lab. Emphasis on creating interfaces and complete applications.

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MR22 – Revised Course Outcome
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Regulation: MR22 **Year/Sem: III /I** **Department: IT**

EN551HS: Advanced English Communication Skills Laboratory

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
CS551PC.1	**Apply** effective listening comprehension and reading strategies to **interpret** complex technical and professional content accurately.	3	Apply	Listening & Reading Comprehension
CS551PC.2	**Develop** professional documents, reports, and technical correspondence to **communicate** information clearly and effectively in written form.	6	Create	Writing Skills & Technical Documentation
CS551PC.3	**Demonstrate** and **evaluate** professional communication skills through presentations, group discussions, and interviews to **enhance** employability.	5	Evaluate	Speaking & Professional Interaction

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	-	1	1	1	2	3	1	2	1	1	-	1
CO2	1	1	1	1	-	1	1	1	2	3	2	2	1	1	-	1
CO3	1	1	1	1	-	1	1	1	3	3	2	2	1	1	-	1
Average	**1.0**	**1.0**	**1.0**	**1.0**	**-**	**1.0**	**1.0**	**1.0**	**2.3**	**3.0**	**1.7**	**2.0**	**1.0**	**1.0**	**-**	**1.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10** - Core focus on professional communication across all modalities (All COs)
Moderate (2)	**PO9** - Teamwork and collaboration in group discussions and professional settings **PO12** - Lifelong learning through continuous communication skill enhancement
Minor (1)	**PO6** - Societal interaction through effective communication **PO7** - Environmental awareness communication **PO8** - Ethical communication practices **PO11** - Project communication management **PSO4** - Research communication abilities
No Mapping	**PO1, PO2, PO3, PO4** - Technical engineering content not primary focus **PO5** - Modern tool usage not emphasized **PSO1, PSO2, PSO3** - Technical computing skills not directly addressed
Cognitive Range	**BTL 3-6** - Practical communication focus (L:0%, M:33%, H:67%) appropriate for language lab. Balanced between applying skills and creating/evaluating communication strategies.

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT601PC: Automata Theory and Compiler Design

Course Outcomes

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

CO Code	Course Outcome Statement	BTL Level	Cognitive Domain	Linked Unit
IT601PC.1	**Differentiate** between finite automata models and **convert** NFA to DFA to solve pattern recognition problems.	4	Analyze	Unit I
IT601PC.2	**Apply** regular expressions and context-free grammars to **construct** language parsers and analyze language properties.	3	Apply	Unit II
IT601PC.3	**Design** pushdown automata and Turing machines to **evaluate** computational problems and decidability.	6	Create	Unit III
IT601PC.4	**Develop** lexical analyzers and parsers using compiler tools to **implement** language translation phases.	6	Create	Unit IV
IT601PC.5	**Optimize** intermediate code and **manage** run-time environments to enhance compiler performance.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	-	-	-	-	-	-	1	3	2	3	1
CO2	3	3	2	2	1	-	-	-	-	-	-	1	3	2	3	1
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	2	3	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	3	3	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3	2	2
Average	**3**	**3**	**2.6**	**2**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3**	**2.4**	**2.6**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1/PO2** - Strong mathematical foundations in automata and language theory (All COs) **PSO1/PSO3** - Core computational theory and mathematical modeling
Moderate (2)	**PO3** - Design of automata and compiler components (COs 3,4) **PO4** - Investigation of language properties and compiler optimization **PO12** - Foundation for advanced computational theory
Minor (1)	**PO5** - Compiler tools and automation usage **PSO2** - Software development fundamentals **PSO4** - Research in computational theory
No Mapping	**PO6, PO7, PO8** - No societal/environmental/ethical focus **PO9, PO10, PO11** - Individual technical work
Cognitive Range	**BTL 3-6** - Advanced computational focus (L:0%, M:40%, H:60%) appropriate for Year 3. Strong emphasis on creating and evaluating computational models.

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MR22 – Revised Course Outcome
B.Tech. VI Semester
Regulation: MR22 Year/Sem: III /II Department: IT

IT602PC: Algorithm Design and Analysis

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Module
IT602PC.1	**Analyze** algorithm performance using asymptotic notations and **apply** divide-and-conquer strategies to solve problems such as binary search, quick sort, merge sort, and Strassen's matrix multiplication.	4	Analyzing	Unit I
IT602PC.2	**Apply** disjoint set operations and **use** greedy strategies to design solutions for job sequencing, knapsack, minimum spanning trees, and single-source shortest path problems.	3	Applying	Unit II
IT602PC.3	**Develop** dynamic programming solutions for optimization problems including optimal BST, 0/1 knapsack, all-pairs shortest path, travelling salesman, and reliability design.	3	Applying	Unit III
IT602PC.4	**Apply** backtracking techniques to solve constraint satisfaction and combinatorial problems such as n-queens, sum of subsets, graph coloring, and Hamiltonian path.	3	Applying	Unit IV
IT602PC.5	**Analyze** branch-and-bound approaches for TSP and knapsack problems and **classify** problems into NP, NP-Hard, and NP-Complete categories using fundamental concepts and Cook's theorem.	4	Analyzing	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	–	–	–	–	–	1	–	2	2	2	3	1
CO2	3	3	2	1	–	–	–	–	–	1	–	2	2	3	3	1
CO3	3	3	2	1	–	–	–	–	–	1	–	2	2	3	3	1
CO4	3	3	2	2	–	–	–	–	–	1	–	2	2	3	3	2
CO5	3	3	2	2	–	–	–	–	–	1	–	2	2	3	3	3
Average	**3.0**	**3.0**	**2.0**	**1.6**	–	–	–	–	–	**1.0**	–	**2.0**	**2.0**	**2.8**	**3.0**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** Every unit involves algorithm principles, mathematical reasoning, recurrence solving, and computational models. **PO2 (Problem Analysis):** Strong mapping because each unit requires identifying problem structure, constraints, and selecting optimal algorithmic strategies. **PSO2 (Software Development Foundations):** Algorithmic techniques form the backbone of advanced programming and software design. **PSO3 (Mathematical Concepts):** Strongly mapped due to recurrences, DP, graph theory, NP theory, and proof-based analysis.
Moderate (2)	**PO3 (Design/Development):** Students design algorithms using greedy, DP, backtracking, and branch & bound paradigms. **PO4 (Investigation):** Investigating algorithm solutions through complexity analysis, recurrence relations, and NP classifications. **PO12 (Life-long Learning):** ADA encourages continuous learning, as algorithms evolve with new technologies. **PSO1 (Computer Systems):** Algorithm efficiency directly impacts system performance and execution models.
Minor (1)	**PO10 (Communication):** Students write algorithm steps, pseudo-code, and explain complexity results. **PSO4 (Research Ability):** Slight mapping through NP-Hard/NP-Complete theory and Cook's theorem, which introduce foundations of computational research.
No Mapping	**PO5, PO6, PO7, PO8, PO9, PO11:**No direct tool usage, No relation to societal, environmental, ethical, teamwork, or project management components in Algorithm Design & Analysis.
Cognitive Range	Course outcomes use **BTL 3 (Applying)** and **BTL 4 (Analyzing)**. This aligns perfectly with **6th semester expectations**: Mid-level cognition (60–70%) and higher-order thinking (20–30%).

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MR22 – Revised Course Outcome
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Regulation: MR22 Year/Sem: III /II Department: IT

IT603PC: Embedded Systems

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT601PC.1	**Analyze** embedded system requirements to **select** appropriate processors and architectures for specific applications.	4	Analyze	Unit I
IT601PC.2	**Design** microcontroller-based systems with proper memory organization and interrupt handling mechanisms.	6	Create	Unit II
IT601PC.3	**Implement** communication protocols and interface controllers to **develop** connected embedded solutions.	3	Apply	Unit III
IT601PC.4	**Develop** embedded firmware using assembly and C programming to **control** hardware components efficiently.	6	Create	Unit IV
IT601PC.5	**Evaluate** real-time operating system services to **optimize** task management and system performance.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	-	-	-	-	-	-	1	3	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3	2	2
CO3	3	3	3	2	2	-	-	-	-	-	-	1	3	3	1	1
CO4	3	3	3	2	2	-	-	-	-	-	-	2	3	3	1	2
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	2	1	2
Average	**3.0**	**3.0**	**2.6**	**2.0**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.6**	**1.4**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1/PO2** - Hardware-software integration and system analysis (All COs) **PSO1** - Computer system architecture and embedded design
Moderate (2)	**PO3** - Design of embedded system solutions (COs 2,3,4) **PO4** - Investigation of system requirements and performance **PO12** - Evolving embedded technologies
Minor (1)	**PO5** - Embedded development tools and IDEs **PSO2** - Low-level software development **PSO4** - Research in embedded applications
No Mapping	**PO6, PO7, PO8** - No societal/environmental/ethical focus **PO9, PO10, PO11** - Individual technical work **PSO3** - Limited mathematical focus
Cognitive Range	**BTL 3-6** - Practical system design focus (L:0%, M:40%, H:60%) suitable for embedded systems. Strong creation and implementation emphasis.

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MC601ES: Artificial Intelligence

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC601ES.1	**Implement** search algorithms and constraint satisfaction techniques to **solve** AI problems efficiently.	3	Apply	Unit I
MC601ES.2	**Develop** advanced search strategies and probabilistic models to **optimize** decision-making processes.	6	Create	Unit II
MC601ES.3	**Design** knowledge representation systems and Bayesian networks to **reason** under uncertainty.	6	Create	Unit III
MC601ES.4	**Apply** machine learning algorithms and decision trees to **build** intelligent learning systems.	3	Apply	Unit IV
MC601ES.5	**Evaluate** expert systems and AI methodologies to **assess** their applicability in real-world domains.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	-	-	-	1	1	1	1	2	2	3	2
CO2	3	3	3	2	2	-	-	-	1	1	1	2	2	3	3	2
CO3	3	3	3	2	2	-	-	-	1	1	1	2	2	3	3	2
CO4	3	3	3	2	2	-	-	-	1	1	1	1	2	3	3	2
CO5	3	3	2	3	2	1	-	1	1	2	1	2	2	2	2	3
Average	**3**	**3**	**2.6**	**2.2**	**2**	**0.2**	**–**	**0.2**	**1**	**1.2**	**1**	**1.6**	**2**	**2.6**	**2.8**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1/PO2** - Strong algorithmic and mathematical foundations in AI (All COs) **PSO3** - Advanced probabilistic and mathematical modeling
Moderate (2)	**PO3** - Design of AI systems and solutions (COs 2,3) **PO4** - Investigation of AI techniques and performance **PO5** - AI tools and framework usage **PSO4** - Research in artificial intelligence
Minor (1)	**PO6** - Societal impact of AI applications **PO8** - AI ethics considerations **PO9/PO10** - Team projects and presentations **PO12** - Rapidly evolving AI field **PSO1/PSO2** - Intelligent system development
No Mapping	**PO7** - Environmental aspects not covered **PO11** - Project management not emphasized
Cognitive Range	**BTL 3-6** - High AI implementation focus (L:0%, M:40%, H:60%) perfect for AI course. Strong creation and evaluation emphasis.

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Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT651PC: Embedded Systems & Internet of Things Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT651PC.1	**Develop** and **implement** embedded system programs using 8051 microcontrollers for I/O operations, timers, interrupts, and serial communication.	4	Analyzing	ES Lab Experiments 1-7 (All 8051 programming exercises)
IT651PC.2	**Interface** sensors and actuators with multiple IoT platforms (Arduino, NodeMCU, Raspberry Pi) and **implement** data acquisition applications.	5	Evaluating	IoT Lab Experiments 1-7 (All sensor interfacing and monitoring applications)
IT651PC.3	**Design** and **integrate** complete embedded IoT systems by combining hardware interfacing, data processing, and application development.	6	Creating	Comprehensive project covering both ES & IoT concepts from all experiments

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	2	-	-	1	1	1	-	2	3	2	2	1
CO2	2	3	3	2	3	-	-	1	1	1	1	2	3	3	2	2
CO3	2	3	3	3	3	-	-	1	2	2	2	3	3	3	2	3
Average	**2**	**3**	**2.67**	**2.33**	**2.67**	**–**	**–**	**1**	**1.33**	**1.33**	**1**	**2.33**	**3**	**2.67**	**2**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-1, PSO-2** - Strong problem analysis, modern tool usage (microcontrollers, IoT platforms), computer systems understanding, and software development.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-3, PSO-4** - Engineering knowledge, design principles, investigation, lifelong learning, and research applications.
Minor (1)	**PO8, PO9, PO10, PO11** - Basic ethics, teamwork, communication, and project management.
No Mapping	**PO6, PO7** - No direct societal or environmental focus.
Cognitive Range	**BTL 4-6** - Practical progression from implementing to designing complete embedded IoT systems.

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT651PC: Compiler Design Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT651PC.1	Implement lexical analyzers and parsers using lex/yacc tools to recognize valid tokens and syntactic constructs of programming languages.	3	Apply	Experiments 1-4, 8-9
IT651PC.2	Design and develop syntax-directed translation schemes and abstract syntax trees for given grammar rules.	4	Analyze	Experiments 5-6
IT651PC.3	Apply storage allocation strategies and type checking mechanisms to build components of a compiler.	4	Analyze	Experiments 7, 10-14

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	-	1	1	-	1	3	3	2	2
CO2	3	3	3	2	3	-	-	-	1	1	-	1	3	3	2	2
CO3	3	3	3	2	3	-	-	-	1	1	-	1	3	3	2	2
Average	3.0	2.7	2.7	2.0	3.0	-	-	-	1.0	1.0	-	1.0	3.0	3.0	2.0	2.0

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO5, PSO1, PSO2** – Strong correlation due to hands-on implementation of compiler components using modern tools (lex/yacc), application of engineering knowledge, and software development skills.
Moderate (2)	**PO2, PO3, PO4, PSO3, PSO4** – Moderate correlation through problem analysis in parsing, design of syntax trees, and investigation of compiler behavior and storage strategies.
Minor (1)	**PO9, PO10, PO12** – Slight correlation via collaborative lab work, documentation, and self-learning of compiler tools.
No Mapping	**PO6, PO7, PO8, PO11** – No direct link to societal, environmental, ethical, or project management aspects.
Cognitive Range	**BTL 3-4** – Appropriate for a 3rd-year lab focusing on application and analysis of compiler design principles.

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT652PC: Embedded Systems Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT652PC.1	Implement and analyze basic microcontroller operations including arithmetic, logical, and timing functions using embedded C/Python.	3	Apply	Experiments 1-3
IT652PC.2	Develop and integrate embedded applications involving sensors, actuators, and communication protocols (RS232, GPIO, USB).	4	Analyze	Experiments 4-8, 12
IT652PC.3	Design and deploy real-world embedded systems such as web servers, IP cameras, and interactive games using Raspberry Pi/Arduino.	5	Evaluate	Experiments 9-11

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	-	1	1	-	1	3	2	2	2
CO2	3	3	3	2	3	-	-	-	2	1	-	1	3	3	2	2
CO3	3	3	3	3	3	1	-	-	2	2	1	2	3	3	2	3
Average	3.0	2.7	2.7	2.3	3.0	0.3	-	-	1.7	1.3	0.3	1.3	3.0	2.7	2.0	2.3

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO5, PSO1** – Strong due to use of embedded hardware/software tools, engineering knowledge, and system implementation.
Moderate (2)	**PO2, PO3, PO4, PSO2, PSO4** – Moderate via problem analysis, design of embedded apps, and investigation of system behavior.
Minor (1)	**PO9, PO10, PO12, PO6** – Slight through teamwork, documentation, and societal impact of embedded solutions.
No Mapping	**PO7, PO8, PO11** – No direct link to sustainability, ethics, or project management.
Cognitive Range	**BTL 3-5** – Aligns with 3rd-year lab focusing on application, analysis, and evaluation of embedded systems.

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MR22 – Revised Course Outcome
B.Tech. VI Semester
Regulation: MR22 Year/Sem: III /II Department: IT

IT653PC: Industrial Oriented Mini Project

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Module
IT653PC.1	Analyze and define real-world problems to formulate project objectives and requirements aligned with industrial needs.	4	Analyze	Problem Identification & Requirement Analysis
IT653PC.2	Design and develop a functional prototype using appropriate technologies and methodologies to address the defined problem.	5	Evaluate	System Design & Implementation
IT653PC.3	Test, validate, and refine the developed solution to ensure it meets specified functional and non-functional requirements.	5	Evaluate	Testing & Validation
IT653PC.4	Document the project lifecycle, including design decisions, implementation details, and test results, following professional standards.	3	Apply	Documentation & Reporting
IT653PC.5	Demonstrate effective teamwork, project management, and presentation skills throughout the project execution.	3	Apply	Project Management & Communication

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	2	-	-	2	1	1	2	2	2	2	3
CO2	3	3	3	3	3	2	-	-	2	1	2	2	3	3	2	3
CO3	3	3	3	3	3	2	-	-	2	1	2	2	3	3	2	3
CO4	2	2	2	2	2	-	-	1	1	3	1	2	2	2	1	2
CO5	1	1	1	1	1	1	-	2	3	3	3	2	1	1	1	2
Average	**2.2**	**2.4**	**2.2**	**2.4**	**2.2**	**1.4**	**-**	**0.6**	**2.0**	**1.8**	**1.8**	**2.0**	**2.2**	**2.2**	**1.6**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO3, PO4, PSO4** – Strong due to problem analysis, design, development, and research-oriented project execution.
Moderate (2)	**PO1, PO5, PO9, PO10, PO11, PO12, PSO1, PSO2** – Moderate via engineering knowledge, tool usage, teamwork, communication, and lifelong learning.
Minor (1)	**PO6, PO8, PSO3** – Slight through societal impact consideration, ethical documentation, and application of mathematical concepts.
No Mapping	**PO7** – No direct link to environmental sustainability.
Cognitive Range	**BTL 3-5** – Appropriate for a 3rd-year project with emphasis on application, analysis, and evaluation.

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MR22 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR22 Year/Sem: IV /I Department: IT

IT701PC: Information Security

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT701PC.1	Explain fundamental security concepts, classical encryption techniques, and cryptographic algorithms including DES and RSA.	2	Understand	Unit I
IT701PC.2	Apply public key cryptography principles and message authentication techniques using hash functions and digital signatures.	3	Apply	Unit II
IT701PC.3	Analyze authentication protocols and email security mechanisms including PGP and S/MIME.	4	Analyze	Unit III
IT701PC.4	Evaluate IP security architecture and web security protocols for secure network communications.	5	Evaluate	Unit IV
IT701PC.5	Assess security threats including intruders, viruses, and firewall technologies for network protection.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	1	-	-	-	1	3	2	2	1
CO2	3	3	2	2	2	-	-	1	-	-	-	1	3	3	2	2
CO3	3	3	2	3	2	-	-	2	-	-	-	1	3	3	2	2
CO4	3	3	3	3	2	1	-	2	-	-	-	2	3	3	2	3
CO5	3	3	3	3	2	1	-	3	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**1.8**	**0.4**	**-**	**1.8**	**-**	**-**	**-**	**1.4**	**3.0**	**2.8**	**2.0**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2** - Strong correlation due to comprehensive coverage of cryptographic algorithms, security protocols, and engineering principles essential for information security systems design and implementation.
Moderate (2)	**PO3, PO4, PO5, PO8, PSO3, PSO4** - Moderate correlation through design of security solutions, investigation of security threats, tool usage for encryption, ethical considerations in security implementation, and research applications.
Minor (1)	**PO6, PO12** - Slight correlation through societal impact of security breaches and need for continuous learning in evolving security landscape.
No Mapping	**PO7, PO9, PO10, PO11** - No direct link to environmental sustainability, teamwork, communication, or project management aspects.
Cognitive Range	**BTL 2-5** - Appropriate range covering understanding to evaluation levels for final year security course, emphasizing critical analysis of security mechanisms.

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT702PC: Cloud Computing

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT702PC.1	**Describe** various computing paradigms , cloud computing fundamentals, and architecture.	2	Understand	Unit I
IT702PC.2	**Explain** deployment /service models and technological drivers in cloud computing environments	2	Understand	Unit II
IT702PC.3	**Apply** programming models like MapReduce for distributed computing in cloud platforms.	3	Apply	Unit III
IT702PC.4	**Analyze** networking requirements and data center architectures for cloud implementations.	4	Analyze	Unit IV
IT702PC.5	**Evaluate** security challenges and advanced concepts in cloud computing systems.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	1	-	-	-	-	1	3	2	1	1
CO2	3	2	2	1	2	-	1	-	-	-	-	1	3	2	1	1
CO3	3	3	3	2	3	-	1	-	-	-	-	2	3	3	2	2
CO4	3	3	3	3	3	-	1	-	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	1	2	1	-	-	-	2	3	3	2	3
Average	**3.0**	**2.6**	**2.4**	**2.0**	**2.4**	**0.2**	**1.2**	**0.2**	**-**	**-**	**-**	**1.6**	**3.0**	**2.6**	**1.6**	**2.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO5, PSO1, PSO2** - Strong correlation through engineering knowledge of cloud architectures, hands-on usage of cloud platforms and tools, and software development for distributed systems.
Moderate (2)	**PO2, PO3, PO4, PO7, PO12, PSO4** - Moderate correlation via problem analysis in cloud environments, design of cloud solutions, investigation of cloud technologies, environmental considerations, and research applications.
Minor (1)	**PO6** - Slight correlation through societal impact of cloud computing accessibility and digital transformation.
No Mapping	**PO8, PO9, PO10, PO11** - No direct emphasis on ethics, teamwork, communication, or project management in course content.
Cognitive Range	**BTL 2-5** - Balanced cognitive levels from understanding cloud concepts to evaluating security challenges, suitable for emerging technology course.

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT751PC: Information Security Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT751PC.1	Implement symmetric and asymmetric cryptographic algorithms including AES, RC4, and RSA.	3	Apply	Cryptography Implementation
IT751PC.2	Analyze and apply authentication mechanisms, digital certificates, and key exchange protocols.	4	Analyze	Authentication & PKI
IT751PC.3	Evaluate security protocols and implement secure web transactions using various cryptographic systems.	5	Evaluate	Security Protocols

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	1	1	1	-	1	3	3	2	2
CO2	3	3	3	3	3	-	-	2	1	1	-	1	3	3	2	3
CO3	3	3	3	3	3	1	-	2	1	1	-	2	3	3	2	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**-**	**1.7**	**1.0**	**1.0**	**-**	**1.3**	**3.0**	**3.0**	**2.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2** - Strong correlation through practical implementation of cryptographic algorithms, analysis of security mechanisms, usage of security tools, and development of secure applications.
Moderate (2)	**PO3, PO4, PO8, PSO4** - Moderate correlation via design of security solutions, investigation of protocol vulnerabilities, ethical implementation, and research-oriented security applications.
Minor (1)	**PO9, PO10, PO12** - Slight correlation through collaborative lab work, documentation of security implementations, and self-learning of new security tools.
No Mapping	**PO6, PO7, PO11** - No direct link to societal, environmental, or project management aspects in lab experiments.
Cognitive Range	**BTL 3-5** - Focus on application, analysis, and evaluation levels appropriate for hands-on security implementation in final year.

MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT752PC: Cloud Computing Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT752PC.1	Configure and deploy virtualized environments and cloud instances using platforms like VirtualBox and AWS.	3	Apply	Cloud Setup & Configuration
IT752PC.2	Develop and deploy applications on cloud platforms using Google App Engine and Hadoop ecosystem.	4	Analyze	Cloud Application Development
IT752PC.3	Evaluate cloud services and implement distributed computing solutions for real-world scenarios.	5	Evaluate	Cloud Services Evaluation

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	1	-	1	1	-	1	3	3	1	2
CO2	3	3	3	3	3	-	1	-	1	1	-	2	3	3	2	3
CO3	3	3	3	3	3	1	2	-	1	1	1	2	3	3	2	3
Average	**3.0**	**2.7**	**2.7**	**2.7**	**3.0**	**0.3**	**1.3**	**-**	**1.0**	**1.0**	**0.3**	**1.7**	**3.0**	**3.0**	**1.7**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO5, PSO1, PSO2** - Strong correlation through practical configuration of cloud environments, deployment on platforms like AWS/Google Cloud, usage of cloud tools, and development of cloud-native applications.
Moderate (2)	**PO2, PO3, PO4, PO7, PSO4** - Moderate correlation via problem-solving in cloud setup, design of cloud architectures, investigation of cloud services, energy efficiency considerations, and research applications.
Minor (1)	**PO9, PO10, PO12** - Slight correlation through team-based cloud deployments, documentation of configurations, and continuous learning of evolving cloud technologies.
No Mapping	**PO6, PO8, PO11** - No direct emphasis on societal impact, ethics, or project management in lab experiments.
Cognitive Range	**BTL 3-5** - Practical focus on application, analysis, and evaluation levels suitable for cloud computing hands-on experience.

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT753PC: Project Stage – I

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Coverage Area
IT752PC.1	**Analyze** industry requirements and identify real-world problems to formulate precise project objectives and scope.	4	Analyzing	Problem Identification & Requirement Analysis
IT752PC.2	**Design** innovative IT solutions using appropriate architectures, technologies, and software engineering principles.	6	Creating	Solution Architecture & System Design
IT752PC.3	**Implement** and **test** the developed solution using modern tools and technologies following industry best practices.	5	Evaluating	Development & Quality Assurance
IT752PC.4	**Document** the project comprehensively including technical specifications, user manuals, and implementation guides.	3	Applying	Technical Documentation & Reporting
IT752PC.5	**Present** project outcomes effectively demonstrating professional communication, teamwork, and project management skills.	4	Analyzing	Professional Presentation & Viva Voce

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	2	1	2	2	2	2	2	2	3	2	3
CO2	3	3	3	2	3	2	1	2	3	2	3	3	3	3	2	3
CO3	3	3	3	2	3	2	1	2	2	2	3	3	3	3	2	3
CO4	2	2	2	2	2	1	1	2	1	3	2	2	2	2	2	2
CO5	2	2	2	2	1	2	1	2	3	3	2	3	2	2	1	3
Average	**2.4**	**2.6**	**2.4**	**2.2**	**2.2**	**1.8**	**1**	**2**	**2.2**	**2.4**	**2.4**	**2.6**	**2.4**	**2.6**	**1.8**	**2.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-4, PO12, PSO-2** - Strong research innovation, lifelong learning, and software development through industry project implementation.
Moderate (2)	**PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11, PSO-1** - Engineering knowledge, problem analysis, design, tools, ethics, teamwork, communication, project management, and computer systems.
Minor (1)	**PO6, PO7, PSO-3** - Basic societal, environmental, and mathematical considerations.
No Mapping	-
Cognitive Range	**BTL 3-6** - Comprehensive progression from application to creation and evaluation.

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MR22 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR22 **Year/Sem: IV /II** **Department: IT**

MS801HS: Organizational Behavior

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MS801HS.1	Explain organizational behavior concepts, perception, and attribution theories in workplace contexts.	2	Understand	Unit I
MS801HS.2	Analyze personality traits, attitudes, and motivational theories for employee behavior understanding.	4	Analyze	Unit II
MS801HS.3	Evaluate communication processes, decision-making strategies, and stress management techniques.	5	Evaluate	Unit III
MS801HS.4	Assess power dynamics, empowerment strategies, and team effectiveness in organizations.	5	Evaluate	Unit IV
MS801HS.5	Apply leadership theories and learning principles for high-performance organizational management.	3	Apply	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	-	-	-	2	1	2	2	2	1	2	1	1	1	1
CO2	1	2	-	1	-	2	1	2	3	2	1	2	1	1	1	2
CO3	1	2	-	1	-	2	1	2	3	3	2	2	1	1	1	2
CO4	1	2	-	1	-	2	1	2	3	3	2	2	1	1	1	2
CO5	1	2	-	1	-	2	1	2	3	3	3	2	1	1	1	2
Average	**1.0**	**1.8**	**-**	**0.8**	**-**	**2.0**	**1.0**	**2.0**	**2.8**	**2.6**	**1.8**	**2.0**	**1.0**	**1.0**	**1.0**	**1.8**

Justification

Strong (3)	**PO9, PO10** - Strong correlation through comprehensive coverage of teamwork dynamics, leadership skills, communication strategies, and interpersonal effectiveness in organizational settings.
Moderate (2)	**PO2, PO6, PO7, PO8, PO11, PO12, PSO4** - Moderate correlation via problem analysis in human behavior, societal impact of organizational practices, sustainable work environments, ethical leadership, project team management, and continuous professional development.
Minor (1)	**PO1, PSO1, PSO2, PSO3** - Slight correlation through basic engineering context understanding and indirect application to software team management.
No Mapping	**PO3, PO4, PO5** - No direct technical design, investigation, or tool usage components in humanities-focused course.
Cognitive Range	**BTL 2-5** - Comprehensive range from understanding behavioral concepts to evaluating organizational strategies, appropriate for professional development course.
Strong (3)	**PO9, PO10** - Strong correlation through comprehensive coverage of teamwork dynamics, leadership skills, communication strategies, and interpersonal effectiveness in organizational settings.

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT851PC: Project Stage – II including Seminar

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT851PC.1	Synthesize knowledge from multiple domains to develop a comprehensive software solution.	6	Create	System Integration
IT851PC.2	Evaluate and refine the implemented system against specified requirements and quality standards.	5	Evaluate	System Validation
IT851PC.3	Create professional documentation and technical reports for the completed project.	4	Analyze	Documentation
IT851PC.4	Design and deliver effective technical presentations demonstrating project outcomes.	3	Apply	Seminar Presentation
IT851PC.5	Demonstrate project management, teamwork, and professional ethics throughout project lifecycle.	3	Apply	Professional Practice

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	2	1	1	3	2	2	3	3	3	2	3
CO2	3	3	3	3	3	2	1	1	2	2	2	3	3	3	2	3
CO3	2	2	2	2	2	-	-	1	1	3	1	2	2	2	1	2
CO4	1	1	1	1	1	-	-	1	2	3	1	2	1	1	1	2
CO5	1	1	1	1	1	1	-	2	3	3	3	2	1	1	1	2
Average	**2**	**2**	**2**	**2**	**2**	**1**	**0.4**	**1.2**	**2.2**	**2.6**	**1.8**	**2.4**	**2**	**2**	**1.4**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO3, PO4, PO10, PO12, PSO1, PSO2, PSO4** - Strong correlation through synthesis of engineering knowledge, complex problem-solving, comprehensive system design, research investigation, professional communication, lifelong learning, and research capability demonstration.
Moderate (2)	**PO5, PO6, PO8, PO9, PO11** - Moderate correlation via appropriate tool usage, societal impact consideration, ethical practices, teamwork, and project management throughout capstone project.
Minor (1)	**PO7** - Slight correlation through consideration of environmental impact in system design where applicable.
No Mapping	**None** - All POs and PSOs have some correlation in this comprehensive capstone experience.
Cognitive Range	**BTL 3-6** - Excellent progression with emphasis on higher-order skills including creation and evaluation, perfectly aligned with final-year capstone expectations.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

IT511PE: Biometrics (Professional Elective I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT511PE.1	Identify various biometric technologies and explain system architecture with performance metrics	2	Understand	Unit I
IT511PE.2	Compare face recognition methods and analyze neural network applications in biometric systems	4	Analyze	Unit II
IT511PE.3	Implement retina and iris segmentation techniques for authentication applications	3	Apply	Unit III
IT511PE.4	Develop fingerprint recognition systems using minutiae extraction algorithms	3	Apply	Unit IV
IT511PE.5	Assess privacy concerns and design biometric cryptography solutions	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	2	-	-	1	-	-	-	1	3	2	2	1
CO2	3	3	2	2	2	-	-	1	-	-	-	1	3	3	2	2
CO3	3	3	2	3	2	-	-	2	-	-	-	1	3	3	2	2
CO4	3	3	3	3	3	1	-	2	-	-	-	2	3	3	2	3
CO5	3	3	3	3	2	1	-	3	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**2.2**	**0.4**	**-**	**1.8**	**-**	**-**	**-**	**1.4**	**3.0**	**2.8**	**2.0**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2** - Course covers engineering principles of biometric systems, requires analysis of authentication problems, applies computer science fundamentals, and develops software for security applications
Moderate (2)	**PO3, PO4, PO5, PO8, PSO3, PSO4** - Students design biometric solutions, investigate recognition algorithms, use programming tools, address ethical concerns, apply mathematics, and conduct research
Minor (1)	**PO6, PO12** - Considers societal impact of biometric privacy and requires continuous learning in evolving security technologies
No Mapping	**PO7, PO9, PO10, PO11** - No environmental sustainability focus, limited teamwork/communication activities, no project management content
Cognitive Range	**BTL 2-4** - 30% understanding, 60% application/analysis, 10% evaluation - Matches elective course expectations

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

IT512PE: Quantum Computing (Professional Elective I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT512PE.1	**Differentiate** classical and quantum computing paradigms and **explain** qubit concepts	2	Understand	Unit I
IT512PE.2	**Apply** linear algebra principles to **solve** quantum computing problems	3	Apply	Unit II
IT512PE.3	**Design** quantum circuits using single and multiple qubit gates	3	Apply	Unit III
IT512PE.4	**Analyze** quantum algorithms including Deutsch and Grover methods	4	Analyze	Unit IV
IT512PE.5	**Evaluate** quantum error correction and cryptographic applications	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	2	3	2
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	2	1	-	2	-	-	-	2	3	3	3	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**1.8**	**0.2**	**-**	**0.4**	**-**	**-**	**-**	**1.6**	**3.0**	**2.6**	**3.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO3** - Requires advanced engineering mathematics, complex quantum problem analysis, computer system principles, and strong mathematical foundations
Moderate (2)	**PO3, PO4, PO5, PO12, PSO2, PSO4** - Students design quantum circuits, investigate algorithms, use computational tools, engage in lifelong learning, and apply research methods
Minor (1)	**PO6, PO8** - Considers societal impact of quantum technologies and ethical aspects of quantum cryptography
No Mapping	**PO7, PO9, PO10, PO11** - No environmental focus, individual learning approach, limited communication activities, no project management
Cognitive Range	**BTL 2-4** - 30% understanding concepts, 50% application, 20% analysis - Appropriate for emerging technology course

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

CS511PE: Advanced Computer Architecture (Professional Elective I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Coverage Area
CS511PE.1	**Explain** parallel computer models and computational parallelism theories	2	Understand	Unit I
CS511PE.2	**Analyze** scalable performance metrics and advanced processor technologies	4	Analyze	Unit II
CS511PE.3	**Evaluate** pipelining techniques and superscalar processor designs	5	Evaluate	Unit III
CS511PE.4	**Design** parallel and scalable architectures for multiprocessor systems	6	Create	Unit IV
CS511PE.5	**Assess** multithreaded architectures and dataflow computing models	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	2	3	2
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	2	-	-	-	-	-	-	2	3	3	3	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.6**	**3.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO3** - Strong correlation through advanced computer architecture engineering knowledge, complex parallel computing problem analysis, computer system design principles, and mathematical foundations of performance modeling
Moderate (2)	**PO3, PO4, PO5, PO12, PSO2, PSO4** - Moderate correlation via design of parallel architectures, investigation of performance issues, computational tool usage, lifelong learning in evolving architectures, software-hardware integration, and research applications
Minor (1)	-
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11** - No direct emphasis on societal, environmental, ethical, teamwork, communication, or project management aspects in pure architecture focus
Cognitive Range	**BTL 2-6** - 20% understanding concepts, 40% analysis/evaluation, 40% design/creation - Advanced technical course with strong higher-order focus

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MR22 – Revised Course Outcome
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CS512PE: Principles of Programming Languages (Professional Elective I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Unit
CS512PE.1	**Describe** programming language syntax, semantics, and evaluation criteria	2	Understand	Unit I
CS512PE.2	**Analyze** data types, binding mechanisms, and control structures in programming languages	4	Analyze	Unit II
CS512PE.3	**Design** subprograms and abstract data types using appropriate language constructs	3	Apply	Unit III
CS512PE.4	**Evaluate** concurrency models and exception handling mechanisms	4	Analyze	Unit IV
CS512PE.5	**Compare** functional, logic, and scripting programming paradigms	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2	1
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	2	2
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	2
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	3
CO5	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**2.0**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2** - Strong correlation through comprehensive engineering knowledge of programming language principles, complex language design problem analysis, computer system language processing, and software development methodologies
Moderate (2)	**PO3, PO4, PO5, PO12, PSO3, PSO4** - Moderate correlation via design of language constructs, investigation of programming paradigms, tool usage for language implementation, lifelong learning in language evolution, mathematical foundations of computation, and research applications
Minor (1)	-
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11** - No direct emphasis on societal, environmental, ethical, teamwork, communication, or project management aspects
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/analysis, 20% evaluation - Theoretical foundation with practical analysis focus

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MR22 – Revised Course Outcome
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IT521PE: DevOps and Its Applications (Professional Elective – II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT521PE.1	**Explain** DevOps principles and agile development methodologies	2	Understand	Unit I
IT521PE.2	**Analyze** DevOps lifecycle and architectural influences	4	Analyze	Unit II
IT521PE.3	**Implement** source code management using Git and GitHub	3	Apply	Unit III
IT521PE.4	**Configure** CI/CD pipelines using Jenkins and Docker	3	Apply	Unit IV
IT521PE.5	**Evaluate** testing automation tools and deployment systems	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2	1	1	1	-	1	-	1	1	1	2	3	3	1	2
CO2	3	3	2	2	2	-	1	-	1	1	1	2	3	3	1	2
CO3	3	3	3	2	3	-	1	-	2	2	2	2	3	3	1	2
CO4	3	3	3	3	3	-	1	-	2	2	2	2	3	3	1	3
CO5	3	3	3	3	3	-	1	-	2	2	2	2	3	3	1	3
Average	**3.0**	**2.8**	**2.4**	**2.2**	**2.4**	**-**	**1.0**	**-**	**1.6**	**1.6**	**1.6**	**2.0**	**3.0**	**3.0**	**1.0**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2** - Strong engineering knowledge of DevOps, complex CI/CD problem analysis, extensive modern tool usage, computer systems integration, software development practices
Moderate (2)	**PO3, PO4, PO9, PO10, PO11, PO12, PSO4** - Design deployment pipelines, investigate automation tools, teamwork in labs, documentation, project planning, continuous learning, research applications
Minor (1)	**PO7** - Energy efficiency considerations in continuous deployment processes
No Mapping	**PO6, PO8** - Limited societal impact analysis and ethical considerations in course content
Cognitive Range	**BTL 2-4** - 30% understanding principles, 50% practical application, 20% analysis/evaluation - Industry-relevant skill development

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B.Tech. V Semester

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IT522PE: Software Testing Methodologies (Professional Elective – II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT522PE.1	**Describe** software testing purposes and path testing concepts	2	Understand	Unit I
IT522PE.2	**Apply** data flow testing strategies and domain testing techniques	3	Apply	Unit II
IT522PE.3	**Implement** logic-based testing using decision tables	3	Apply	Unit III
IT522PE.4	**Design** state transition testing for complex systems	3	Apply	Unit IV
IT522PE.5	**Analyze** graph matrices and **evaluate** testing tools	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	1	-	-	-	1	3	3	2	1
CO2	3	3	2	2	2	-	-	1	-	-	-	1	3	3	2	2
CO3	3	3	2	3	2	-	-	1	-	-	-	1	3	3	2	2
CO4	3	3	3	3	3	-	-	1	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	1	-	2	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**2.2**	**0.2**	**-**	**1.2**	**-**	**-**	**-**	**1.4**	**3.0**	**3.0**	**2.0**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2** - Comprehensive engineering knowledge of testing methods, complex software quality problem analysis, computer system validation, software development QA
Moderate (2)	**PO3, PO4, PO5, PO8, PSO3, PSO4** - Design test strategies, investigate testing techniques, use automation tools, ethical testing practices, mathematical analysis, research applications
Minor (1)	**PO6, PO12** - Societal impact of software reliability, continuous learning in testing methodologies
No Mapping	**PO7, PO9, PO10, PO11** - No environmental focus, individual learning approach, limited communication, no project management
Cognitive Range	**BTL 2-4** - 30% understanding concepts, 60% application/implementation, 10% analysis/evaluation - Quality assurance focus

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MR22 – Revised Course Outcome
B.Tech. V Semester

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CS521PE: Data Analytics (Professional Elective – II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS521PE.1	**Explain** data management architecture and quality assessment techniques	2	Understand	Unit I
CS521PE.2	**Analyze** business modeling concepts and data analytics applications	4	Analyze	Unit II
CS521PE.3	**Apply** regression analysis and logistic regression for predictive modeling	3	Apply	Unit III
CS521PE.4	**Design** segmentation models using decision trees and time series analysis	3	Apply	Unit IV
CS521PE.5	**Evaluate** data visualization techniques for analytical insights	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	2	-	-	-	-	-	-	1	3	2	3	1
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	3	1	-	1	-	-	-	2	3	3	3	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**2.6**	**0.2**	**-**	**0.2**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**3.0**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO3 - PO1:** Strong engineering knowledge of data analytics principles, statistical methods, and predictive modeling. **PO2:** Complex problem analysis using data-driven approaches and analytical reasoning. **PSO1:** Computer systems foundation for data processing and analysis. **PSO3:** Mathematical and statistical foundations for analytics algorithms.
Moderate (2)	**PO3, PO4, PO5, PO12, PSO2, PSO4 - PO3:** Design of analytical models and data pipelines. **PO4:** Investigation of data patterns and business insights. **PO5:** Usage of analytics tools and platforms. **PO12:** Lifelong learning in evolving analytics technologies. **PSO2:** Software development for analytical applications. **PSO4:** Research applications in data analytics.
Minor (1)	**PO6, PO8 - PO6:** Societal impact through data-driven decision making applications. **PO8:** Ethical considerations in data privacy and usage.
No Mapping	**PO7, PO9, PO10, PO11 - PO7:** No environmental sustainability focus. **PO9:** Primarily individual analytical work. **PO10:** Limited formal communication emphasis. **PO11:** No project management content.
Cognitive Range	**PO1, PO2, PSO1, PSO3 - PO1:** Strong engineering knowledge of data analytics principles, statistical methods, and predictive modeling. **PO2:** Complex problem analysis using data-driven approaches and analytical reasoning. **PSO1:** Computer systems foundation for data processing and analysis. **PSO3:** Mathematical and statistical foundations for analytics algorithms.

MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

CS523PE: Data Science (Professional Elective – II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS523PE.1	**Explain** statistical inference concepts and probability distributions for data science	2	Understand	Unit I
CS523PE.2	**Apply** exploratory data analysis techniques and machine learning algorithms	3	Apply	Unit II
CS523PE.3	**Analyze** Naive Bayes classification for real-world applications like spam filtering	4	Analyze	Unit III
CS523PE.4	**Design** feature generation and selection methods for data preprocessing	3	Apply	Unit IV
CS523PE.5	**Evaluate** data visualization principles and ethical issues in data science	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	2	-	-	-	-	-	-	1	3	2	3	2
CO2	3	3	2	2	3	-	-	-	-	-	-	1	3	3	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	3	1	-	1	-	-	-	2	3	3	3	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**2.8**	**0.2**	**-**	**0.2**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**3.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO3 - PO1:** Comprehensive engineering knowledge of data science principles, statistical methods, and machine learning algorithms. **PO2:** Complex analytical problem solving using data-driven approaches and predictive modeling. **PO5:** Extensive use of modern data science tools including Python, R, and analytical platforms. **PSO1:** Strong foundation in computer systems for large-scale data processing and analysis. **PSO3:** Heavy emphasis on mathematical and statistical foundations for machine learning algorithms.
Moderate (2)	**PO3, PO4, PO12, PSO2, PSO4 - PO3:** Design of data pipelines, feature engineering methods, and machine learning models. **PO4:** Investigation of data patterns, model performance, and business insights. **PO12:** Lifelong learning in rapidly evolving data science technologies and methodologies. **PSO2:** Software development for data science applications and analytical solutions. **PSO4:** Research applications in data science domain including experimental design and result interpretation.
Minor (1)	**PO6, PO8 - PO6:** Societal impact considerations through data-driven decision making and predictive analytics applications. **PO8:** Ethical considerations in data privacy, bias in algorithms, and responsible AI practices.
No Mapping	**PO7, PO9, PO10, PO11 - PO7:** No specific environmental sustainability focus in course content. **PO9:** Primarily individual analytical work with limited team collaboration requirements. **PO10:** Limited emphasis on formal communication and presentation skills development. **PO11:** No specific project management methodologies covered in curriculum.
Cognitive Range	**BTL 2-4 - 20% Understanding** fundamental data science concepts and statistical foundations. **60% Application/Analysis** of machine learning algorithms, exploratory data analysis, and feature engineering techniques. **20% Evaluation** of data visualization principles and ethical considerations in data science applications. Well-aligned with practical data science requirements.

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MR22 – Revised Course Outcome
B.Tech. V Semester

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IT523PE: DevOps and Its Applications Lab (Professional Elective – II Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT523PE.1	**Implement** DevOps workflows using Git and GitHub for source code management	3	Apply	Source Code Management
IT523PE.2	**Configure** CI/CD pipelines using Jenkins and containerized applications with Docker	3	Apply	CI/CD Pipeline Setup
IT523PE.3	**Evaluate** automated testing and deployment systems using DevOps tools	4	Analyze	Testing & Deployment

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	1	-	2	1	1	2	3	3	1	2
CO2	3	3	3	3	3	-	1	-	2	1	1	2	3	3	1	3
CO3	3	3	3	3	3	1	1	-	2	1	1	2	3	3	1	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**1.0**	**-**	**2.0**	**1.0**	**1.0**	**2.0**	**3.0**	**3.0**	**1.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2** - Strong engineering knowledge of DevOps principles, complex pipeline problem analysis, extensive modern tool usage, computer system integration, and software development automation
Moderate (2)	**PO3, PO4, PO9, PO12, PSO4** - Design of deployment pipelines, investigation of automation issues, teamwork in lab exercises, lifelong learning, research applications
Minor (1)	**PO6, PO7, PO10, PO11** - Societal impact through efficient software delivery, energy efficiency in CI/CD, basic documentation, project planning aspects
No Mapping	**PO8** - No specific ethical considerations in lab exercises
Cognitive Range	**BTL 3-4** - 70% practical application, 30% analysis/evaluation - Hands-on DevOps implementation focus

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IT524PE: Software Testing Methodologies Lab (Professional Elective – II Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT524PE.1	**Implement** GUI and bitmap checkpoints for software testing	3	Apply	GUI Testing
IT524PE.2	**Apply** database checkpointing and data-driven testing techniques	3	Apply	Database Testing
IT524PE.3	**Analyze** test results and evaluate testing strategies for applications	4	Analyze	Test Analysis

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	1	-	-	-	1	3	3	1	2
CO2	3	3	3	3	3	-	-	1	-	-	-	1	3	3	1	2
CO3	3	3	3	3	3	1	-	2	-	-	-	2	3	3	1	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**-**	**1.3**	**-**	**-**	**-**	**1.3**	**3.0**	**3.0**	**1.0**	**2.3**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2** - Comprehensive testing engineering knowledge, complex quality assurance problem analysis, modern testing tool usage, computer system validation, software quality development
Moderate (2)	**PO3, PO4, PO8, PO12, PSO4** - Design of test strategies, investigation of software defects, ethical testing practices, lifelong learning, research applications
Minor (1)	**PO6** - Societal impact through software reliability and quality
No Mapping	**PO7, PO9, PO10, PO11** - No environmental focus, individual testing work, limited communication, no project management
Cognitive Range	**BTL 3-4** - 70% practical testing implementation, 30% analysis/evaluation - Quality assurance focus

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MR22 – Revised Course Outcome
B.Tech. V Semester

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CS524PE: Data Analytics Lab (Professional Elective – II Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS524PE.1	**Implement** data preprocessing and statistical operations using Python	3	Apply	Data Preprocessing
CS524PE.2	**Apply** regression techniques and classification algorithms on datasets	3	Apply	Predictive Modeling
CS524PE.3	**Evaluate** clustering results and data visualization techniques	4	Analyze	Results Analysis

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	-	-	-	1	3	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	3	1	-	1	-	-	-	2	3	3	3	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**-**	**0.3**	**-**	**-**	**-**	**1.7**	**3.0**	**3.0**	**3.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2, PSO3 - PO1:** Strong engineering knowledge of data analytics principles and statistical methods. **PO2:** Complex data analysis problems and predictive modeling challenges. **PO5:** Extensive use of Python, pandas, scikit-learn, and visualization tools. **PSO1:** Computer systems foundation for data processing and analysis. **PSO2:** Software development for analytical applications. **PSO3:** Mathematical and statistical foundations for analytics algorithms.
Moderate (2)	**PO3, PO4, PO12, PSO4 - PO3:** Design of analytical models and data processing pipelines. **PO4:** Investigation of data patterns and model performance. **PO12:** Lifelong learning in evolving analytics technologies and tools. **PSO4:** Research applications in data analytics through experimental analysis.
Minor (1)	**PO6, PO8 - PO6:** Societal impact through data-driven insights and decision making. **PO8:** Ethical considerations in data usage and privacy protection.
No Mapping	**PO7, PO9, PO10, PO11 - PO7:** No environmental sustainability focus in lab exercises. **PO9:** Primarily individual analytical work with limited collaboration. **PO10:** Limited emphasis on formal communication skills. **PO11:** No project management methodologies covered.
Cognitive Range	**BTL 3-4 - 70% Application** of data preprocessing, statistical operations, and machine learning algorithms. **30% Analysis/Evaluation** of clustering results and visualization techniques. Appropriate for hands-on analytics laboratory work.

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MR22 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR22 **Year/Sem: III /I** **Department: IT**

CS526PE: Data Science Lab (Professional Elective – II Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS526PE.1	**Implement** data manipulation and descriptive statistics using R programming	3	Apply	Data Manipulation
CS526PE.2	**Apply** regression models and classification algorithms on real datasets	3	Apply	Machine Learning
CS526PE.3	**Analyze** clustering models and evaluate visualization techniques	4	Analyze	Model Evaluation

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	-	-	-	1	3	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	3	1	-	1	-	-	-	2	3	3	3	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**-**	**0.3**	**-**	**-**	**-**	**1.7**	**3.0**	**3.0**	**3.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2, PSO3 - PO1:** Comprehensive engineering knowledge of data science principles, statistical methods, and machine learning algorithms through practical implementation. **PO2:** Complex analytical problem solving using data-driven approaches and predictive modeling on real datasets. **PO5:** Extensive use of R programming, statistical packages, and data science tools for practical implementation. **PSO1:** Strong foundation in computer systems for data processing and analytical computations. **PSO2:** Software development for data science applications and machine learning solutions. **PSO3:** Heavy emphasis on mathematical and statistical foundations through practical implementation of algorithms.
Moderate (2)	**PO3, PO4, PO12, PSO4 - PO3:** Design of data processing pipelines, feature engineering methods, and machine learning workflows. **PO4:** Investigation of data patterns, model performance evaluation, and result interpretation. **PO12:** Lifelong learning in rapidly evolving data science technologies and programming methodologies. **PSO4:** Research applications through experimental data analysis and model validation exercises.
Minor (1)	**PO6, PO8 - PO6:** Societal impact considerations through practical applications of data-driven insights and predictive analytics. **PO8:** Ethical considerations in data handling, privacy protection, and responsible data usage practices.
No Mapping	**PO7, PO9, PO10, PO11 - PO7:** No specific environmental sustainability focus in lab exercises. **PO9:** Primarily individual programming and analytical work with limited team collaboration requirements. **PO10:** Limited emphasis on formal communication and documentation skills development. **PO11:** No specific project management methodologies covered in laboratory sessions.
Cognitive Range	**BTL 3-4 - 70% Application** of R programming, data manipulation, statistical analysis, and machine learning algorithms on real datasets. **30% Analysis/Evaluation** of clustering results, model performance, and data visualization effectiveness. Well-aligned with practical data science laboratory requirements focusing on hands-on implementation skills.

MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT631PE: Data Mining (Professional Elective – III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT631PE.1	**Explain** data mining functionalities and preprocessing techniques	2	Understand	Unit I
IT631PE.2	**Implement** association rule mining using Apriori algorithm	3	Apply	Unit II
IT631PE.3	**Apply** classification techniques including decision trees	3	Apply	Unit III
IT631PE.4	**Design** clustering solutions using partitioning methods	3	Apply	Unit IV
IT631PE.5	**Analyze** web mining and spatial mining applications	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	3	2
CO3	3	3	2	3	2	-	-	-	-	-	-	1	3	3	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	3	1	-	1	-	-	-	2	3	3	3	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**2.2**	**0.2**	**-**	**0.2**	**-**	**-**	**-**	**1.4**	**3.0**	**2.8**	**3.0**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO3** - Advanced engineering algorithms knowledge, complex pattern analysis problems, computer system data processing, strong mathematical foundations
Moderate (2)	**PO3, PO4, PO5, PO12, PSO2, PSO4** - Design mining solutions, investigate patterns, use analytical tools, lifelong learning, software development, research applications
Minor (1)	**PO6, PO8** - Societal impact of data privacy, ethical data mining considerations
No Mapping	**PO7, PO9, PO10, PO11** - No environmental focus, individual analytical work, limited communication, no project management
Cognitive Range	**BTL 2-4** - 30% understanding concepts, 50% practical application, 20% analysis - Data analytics skill development

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT632PE: Natural Language Processing (Professional Elective – III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT632PE.1	**Describe** morphological analysis and document structure methods	2	Understand	Unit I
IT632PE.2	**Implement** syntactic parsing techniques and treebank applications	3	Apply	Unit II
IT632PE.3	**Apply** semantic parsing and word sense disambiguation	3	Apply	Unit III
IT632PE.4	**Design** discourse processing and coherence mechanisms	3	Apply	Unit IV
IT632PE.5	**Analyze** language modeling approaches and multilingual applications	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	2	2
CO3	3	3	2	3	2	-	-	-	-	-	-	1	3	3	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	1	-	1	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**2.2**	**0.2**	**-**	**0.2**	**-**	**-**	**-**	**1.4**	**3.0**	**2.8**	**2.0**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2** - Engineering knowledge of NLP algorithms, complex language processing problems, computer system text analysis, software development for language applications
Moderate (2)	**PO3, PO4, PO5, PO12, PSO4** - Design parsing systems, investigate linguistic patterns, use NLP tools, lifelong learning, research applications
Minor (1)	**PO6, PO8** - Societal impact of language technologies, ethical text analysis considerations
No Mapping	**PO7, PO9, PO10, PO11** - No environmental focus, individual computational work, limited communication, no project management
Cognitive Range	**BTL 2-4** - 30% understanding linguistic concepts, 50% algorithm implementation, 20% analysis - AI application focus

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

CS631PE: Full Stack Development (Professional Elective – III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS631PE.1	**Explain** full stack development components and Node.js fundamentals	2	Understand	Unit I
CS631PE.2	**Apply** Node.js modules for file system operations and HTTP services	3	Apply	Unit II
CS631PE.3	**Analyze** MongoDB data models and database administration tasks	4	Analyze	Unit III
CS631PE.4	**Design** web applications using Express framework and Angular components	3	Apply	Unit IV
CS631PE.5	**Evaluate** React components for building interactive user interfaces	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	2	-	-	-	-	-	-	1	3	3	1	2
CO2	3	3	2	2	3	-	-	-	-	-	-	1	3	3	1	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	1	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	1	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	3	1	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**2.8**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**3.0**	**1.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2 - PO1:** Comprehensive engineering knowledge of full stack development principles and web architecture. **PO2:** Complex web application problem analysis and solution design. **PO5:** Extensive use of modern development tools including Node.js, MongoDB, Express, Angular, and React. **PSO1:** Strong foundation in computer systems for web application deployment. **PSO2:** End-to-end software development for web applications.
Moderate (2)	**PO3, PO4, PO12, PSO4 - PO3:** Design of web application architecture and component integration. **PO4:** Investigation of performance issues and optimization techniques. **PO12:** Lifelong learning in evolving web technologies and frameworks. **PSO4:** Research applications in full stack development methodologies.
Minor (1)	**PSO3** - Basic programming logic and algorithmic thinking.
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11** - No societal, environmental, ethical, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/implementation, 20% analysis/evaluation - Comprehensive full stack development focus.

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

CS633PE: Mobile Application Development (Professional Elective – III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS633PE.1	**Explain** Android OS architecture and application development framework	2	Understand	Unit I
CS633PE.2	**Design** user interfaces using layouts and UI components in Android	3	Apply	Unit II
CS633PE.3	**Apply** intents and broadcasts for inter-component communication	3	Apply	Unit III
CS633PE.4	**Analyze** persistent storage mechanisms using files and shared preferences	4	Analyze	Unit IV
CS633PE.5	**Evaluate** database operations and content providers for data management	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	2	-	-	-	-	-	-	1	3	3	1	2
CO2	3	3	3	2	3	-	-	-	-	-	-	1	3	3	1	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	1	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	1	3
CO5	3	3	3	3	3	1	-	1	-	-	-	2	3	3	1	3
Average	**3.0**	**2.8**	**2.6**	**2.4**	**2.8**	**0.2**	**-**	**0.2**	**-**	**-**	**-**	**1.6**	**3.0**	**3.0**	**1.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2 - PO1:** Comprehensive engineering knowledge of mobile application development and Android architecture. **PO2:** Complex mobile application problem analysis and user experience design. **PO5:** Extensive use of Android Studio, emulators, and mobile development tools. **PSO1:** Strong foundation in mobile computing systems and platforms. **PSO2:** End-to-end software development for mobile applications.
Moderate (2)	**PO3, PO4, PO12, PSO4 - PO3:** Design of mobile application architecture and user interfaces. **PO4:** Investigation of performance issues and mobile-specific challenges. **PO12:** Lifelong learning in evolving mobile technologies and platforms. **PSO4:** Research applications in mobile computing and application development.
Minor (1)	**PO6, PO8, PSO3 - PO6:** Societal impact through mobile technology applications. **PO8:** Ethical considerations in mobile data privacy and permissions. **PSO3:** Basic programming logic for mobile applications.
No Mapping	**PO7, PO9, PO10, PO11** - No environmental, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/design, 20% analysis/evaluation - Comprehensive mobile development focus.

MR22 – Revised Course Outcome
B.Tech. VI Semester
Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT611PE: Data Mining Lab (Professional Elective – III Lab)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT611PE.1	**Apply** preprocessing techniques and attribute-oriented induction algorithms	3	Apply	Data Preprocessing
IT611PE.2	**Implement** association rule mining using Apriori and FP-Growth algorithms	3	Apply	Association Analysis
IT611PE.3	**Evaluate** classification and clustering algorithms using Weka/Python tools	4	Analyze	Algorithm Evaluation

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	-	-	-	1	3	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO3	3	3	3	3	3	1	-	1	-	-	-	2	3	3	3	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**-**	**0.3**	**-**	**-**	**-**	**1.7**	**3.0**	**3.0**	**3.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2, PSO3** - Strong data mining engineering knowledge, complex pattern analysis problems, Weka/Python tool usage, computer data processing systems, software development, mathematical algorithm foundations
Moderate (2)	**PO3, PO4, PO12, PSO4** - Design of mining workflows, investigation of data patterns, lifelong learning, research applications
Minor (1)	**PO6, PO8** - Societal impact through data insights, ethical data mining considerations
No Mapping	**PO7, PO9, PO10, PO11** - No environmental focus, individual analytical work, limited communication, no project management
Cognitive Range	**BTL 3-4** - 70% algorithm implementation, 30% analysis/evaluation - Practical data mining focus

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT612PE: Natural Language Processing Lab (Professional Elective – III Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT612PE.1	**Implement** word analysis and morphology processing techniques	3	Apply	Text Processing
IT612PE.2	**Apply** N-gram models and POS tagging using Hidden Markov Models	3	Apply	Language Modeling
IT612PE.3	**Analyze** chunking algorithms and evaluate NLP system performance	4	Analyze	System Evaluation

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	-	-	-	1	3	3	2	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2	3
CO3	3	3	3	3	3	1	-	1	-	-	-	2	3	3	2	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**-**	**0.3**	**-**	**-**	**-**	**1.7**	**3.0**	**3.0**	**2.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2** - Comprehensive NLP engineering knowledge, complex language processing problems, NLTK/PyTorch tool usage, computer language systems, NLP software development
Moderate (2)	**PO3, PO4, PO12, PSO3, PSO4** - Design of NLP pipelines, investigation of linguistic patterns, lifelong learning, mathematical foundations, research applications
Minor (1)	**PO6, PO8** - Societal impact through language technologies, ethical NLP considerations
No Mapping	**PO7, PO9, PO10, PO11** - No environmental focus, individual NLP work, limited communication, no project management
Cognitive Range	**BTL 3-4** - 70% NLP implementation, 30% analysis/evaluation - Practical NLP focus

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

CS611PE: Full Stack Development Lab (Professional Elective – III Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS611PE.1	**Implement** Node.js applications and user login systems	3	Apply	Backend Development
CS611PE.2	**Apply** MongoDB operations and CRUD functionalities on datasets	3	Apply	Database Operations
CS611PE.3	**Design** web applications using Angular and React components	3	Apply	Frontend Development

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	1	-	-	1	3	3	1	2
CO2	3	3	3	3	3	-	-	-	1	-	-	2	3	3	1	3
CO3	3	3	3	3	3	-	-	-	1	-	-	2	3	3	1	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**-**	**-**	**-**	**1.0**	**-**	**-**	**1.7**	**3.0**	**3.0**	**1.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2** - Comprehensive full stack engineering knowledge, complex web development problems, modern development tools usage, computer web systems, end-to-end software development
Moderate (2)	**PO3, PO4, PO12, PSO4** - Design of web architectures, investigation of performance issues, lifelong learning, research applications
Minor (1)	**PO9, PSO3** - Basic teamwork in lab exercises, programming logic
No Mapping	**PO6, PO7, PO8, PO10, PO11** - No societal, environmental, ethical, communication, or project management focus
Cognitive Range	**BTL 3** - 100% practical application - Hands-on full stack development focus

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

CS613PE: Mobile Application Development Lab (Professional Elective – III Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS613PE.1	**Implement** Android applications with user interfaces and event handling	3	Apply	App Development
CS613PE.2	**Apply** intents, notifications, and persistent storage mechanisms	3	Apply	Mobile Features
CS613PE.3	**Design** database applications and content providers for data management	3	Apply	Data Management

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	-	-	-	1	-	-	1	3	3	1	2
CO2	3	3	3	3	3	-	-	-	1	-	-	2	3	3	1	3
CO3	3	3	3	3	3	1	-	1	1	-	-	2	3	3	1	3
Average	**3.0**	**3.0**	**2.7**	**2.7**	**3.0**	**0.3**	**-**	**0.3**	**1.0**	**-**	**-**	**1.7**	**3.0**	**3.0**	**1.0**	**2.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2** - Comprehensive mobile development engineering knowledge, complex app design problems, Android Studio tool usage, mobile computing systems, mobile software development
Moderate (2)	**PO3, PO4, PO12, PSO4** - Design of mobile architectures, investigation of mobile-specific issues, lifelong learning, research applications
Minor (1)	**PO6, PO8, PO9, PSO3** - Societal mobile impact, ethical data considerations, basic teamwork, programming logic
No Mapping	**PO7, PO10, PO11** - No environmental, communication, or project management focus
Cognitive Range	**BTL 3** - 100% practical application - Hands-on mobile development focus

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT741PE: Human Computer Interaction (Professional Elective – IV)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Phase
IT741PE.1	**Explain** HCI principles, graphical user interfaces, and design goals	2	Understand	Unit I
IT741PE.2	**Analyze** human characteristics and screen design processes	4	Analyze	Unit II
IT741PE.3	**Apply** window navigation schemes and multimedia components	3	Apply	Unit III
IT741PE.4	**Evaluate** software processes and usability engineering methods	4	Analyze	Unit IV
IT741PE.5	**Design** cognitive models for user-centered applications	3	Apply	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	1	-	1	-	1	-	1	3	3	1	2
CO2	3	3	2	2	2	1	-	1	-	1	-	1	3	3	1	2
CO3	3	3	3	2	2	1	-	1	-	1	-	1	3	3	1	2
CO4	3	3	3	3	2	1	-	1	-	1	-	2	3	3	1	3
CO5	3	3	3	3	2	1	-	1	-	1	-	2	3	3	1	3
Average	**3.0**	**2.8**	**2.4**	**2.2**	**1.8**	**1.0**	**-**	**1.0**	**-**	**1.0**	**-**	**1.4**	**3.0**	**3.0**	**1.0**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2 - PO1:** Comprehensive engineering knowledge of HCI principles and user interface design. **PO2:** Complex user experience problem analysis and interaction design challenges. **PSO1:** Computer-human interaction systems and interface design principles. **PSO2:** User-centered software development methodologies.
Moderate (2)	**PO3, PO4, PO12, PSO4 - PO3:** Design of user interfaces and interaction patterns. **PO4:** Investigation of usability issues and user behavior. **PO12:** Lifelong learning in evolving HCI technologies. **PSO4:** Research applications in human-computer interaction.
Minor (1)	**PO6, PO8, PO10, PSO3 - PO6:** Societal impact through accessible and usable technology. **PO8:** Ethical considerations in user privacy and data handling. **PO10:** Communication skills in documenting design decisions. **PSO3:** Basic mathematical models in interface design.
No Mapping	**PO5, PO7, PO9, PO11 - PO5:** Limited tool usage emphasis. **PO7:** No environmental sustainability focus. **PO9:** Primarily individual design work. **PO11:** No project management content.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/analysis, 20% evaluation - User-centered design focus

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT742PE: High Performance Computing (Professional Elective – IV)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT742PE.1	**Explain** modern processor architectures and memory hierarchies	2	Understand	Unit I
IT742PE.2	**Analyze** parallel computing paradigms and scalability metrics	4	Analyze	Unit II
IT742PE.3	**Apply** OpenMP for shared-memory parallel programming	3	Apply	Unit III
IT742PE.4	**Design** MPI-based solutions for distributed systems	3	Apply	Unit IV
IT742PE.5	**Evaluate** CUDA programming models for GPU computing	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	2	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.6**	**3.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO3 - PO1:** Advanced computer architecture engineering knowledge. **PO2:** Complex parallel computing problem analysis. **PO5:** Extensive use of HPC tools including OpenMP, MPI, CUDA. **PSO1:** Computer system principles for high-performance computing. **PSO3:** Mathematical foundations of parallel algorithms.
Moderate (2)	**PO3, PO4, PO12, PSO2, PSO4 - PO3:** Design of parallel architectures and algorithms. **PO4:** Investigation of performance optimization techniques. **PO12:** Lifelong learning in HPC technologies. **PSO2:** Software development for parallel applications. **PSO4:** Research applications in high-performance computing.
Minor (1)	-
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11** - No societal, environmental, ethical, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/design, 20% analysis/evaluation - High-performance computing focus

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT743PE: Information Retrieval Systems (Professional Elective – IV)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT743PE.1	**Explain** information retrieval system capabilities and functionalities	2	Understand	Unit I
IT743PE.2	**Analyze** cataloging processes and data structures for IR	4	Analyze	Unit II
IT743PE.3	**Apply** automatic indexing and document clustering techniques	3	Apply	Unit III
IT743PE.4	**Design** user search techniques and visualization methods	3	Apply	Unit IV
IT743PE.5	**Evaluate** text search algorithms and multimedia retrieval	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	2	2
CO3	3	3	2	3	2	-	-	-	-	-	-	1	3	3	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	1	-	1	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**2.2**	**0.2**	**-**	**0.2**	**-**	**-**	**-**	**1.4**	**3.0**	**2.8**	**2.0**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2 - PO1:** Comprehensive IR engineering knowledge and search algorithms. **PO2:** Complex information retrieval problem analysis. **PSO1:** Computer systems for information processing. **PSO2:** Software development for search applications.
Moderate (2)	**PO3, PO4, PO5, PO12, PSO4 - PO3:** Design of retrieval systems and search interfaces. **PO4:** Investigation of search performance and relevance. **PO5:** IR tool and platform usage. **PO12:** Lifelong learning in search technologies. **PSO4:** Research applications in information retrieval.
Minor (1)	**PO6, PO8, PSO3 - PO6:** Societal impact through information access. **PO8:** Ethical considerations in search and privacy. **PSO3:** Mathematical models in retrieval algorithms.
No Mapping	**PO7, PO9, PO10, PO11** - No environmental, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/design, 20% analysis/evaluation - Information systems focus

MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

CS745PE: Ad-hoc and Sensor Networks (Professional Elective – IV)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS521OE.1	**Explain** the fundamental concepts of data organization, abstract data types, and basic operations on arrays and linked lists.	2	Understanding	Unit I – Introduction to Data Structures
CS521OE.2	**Apply** stack and queue data structures to **solve** problems involving recursion, expression evaluation, and scheduling.	3	Applying	Unit II – Stacks & Queues
CS521OE.3	**Analyze** linked lists, trees, and graphs to **represent** hierarchical and network data structures.	4	Analyzing	Unit III – Linked Lists, Trees & Graphs
CS521OE.4	**Implement** sorting and searching algorithms to **evaluate** time and space efficiency.	5	Evaluating	Unit IV – Searching & Sorting Techniques
CS521OE.5	**Design** solutions for real-world problems using appropriate data structures and **compare** their performance.	5	Evaluating	Unit V – Case Studies & Applications

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1	-	-	-	-	-	1	-	1	1	1	2	1
CO2	2	2	2	1	1	-	-	-	-	1	-	1	1	2	3	1
CO3	2	3	2	2	1	-	-	-	-	1	-	1	2	2	3	1
CO4	2	3	2	2	1	-	-	-	-	1	-	1	1	2	3	1
CO5	2	3	3	2	2	1	-	-	1	2	-	2	2	3	3	2
Average	**2**	**2.4**	**2**	**1.6**	**1**	**0.2**	**–**	**–**	**0.2**	**1.2**	**–**	**1.2**	**1.4**	**2**	**2.8**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Foundation of mathematical concepts)** is strongly addressed as data structures fundamentally rely on mathematical modeling and algorithm analysis (CO2-CO5). **PO2 (Problem analysis)** is key in analyzing and selecting appropriate data structures for problem-solving (CO3-CO5).
Moderate (2)	**PO1 (Engineering knowledge), PO3 (Design solutions), PSO-2 (Software development)** are consistently applied through understanding data organization principles and designing efficient solutions.
Minor (1)	**PO4 (Investigations), PO5 (Modern tools), PO6 (Society), PO10 (Communication), PO12 (Life-long learning), PSO-1 (Computer systems), PSO-4 (Research)** are partially addressed through basic investigations, tool usage, and communication of solutions.
No Mapping	**PO7 (Environment), PO8 (Ethics), PO9 (Teamwork), PO11 (Project management)** are not directly addressed in this fundamental course focused on individual data structure concepts.
Cognitive Range	**BTL 2–5 (Understanding → Evaluating)** – The course effectively progresses from understanding basic concepts to evaluating algorithm efficiency and designing solutions, covering essential cognitive levels for data structures.

MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT621OE: Human Computer Interaction (Open Elective II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS745PE.1	**Explain** MANET characteristics and routing challenges	2	Understand	Unit I
CS745PE.2	**Analyze** data transmission methods and multicast protocols	4	Analyze	Unit II
CS745PE.3	**Apply** geocaching techniques for ad-hoc networks	3	Apply	Unit III
CS745PE.4	**Design** wireless sensor network architectures	3	Apply	Unit IV
CS745PE.5	**Evaluate** mobile robot integration in WSNs	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	2	2
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	3
CO5	3	3	3	3	2	1	-	-	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**1.8**	**0.2**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**2.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2 - PO1:** Wireless network engineering knowledge and protocols. **PO2:** Complex ad-hoc network problem analysis. **PSO1:** Computer network systems and wireless communications. **PSO2:** Network software development.
Moderate (2)	**PO3, PO4, PO5, PO12, PSO4 - PO3:** Design of network architectures and protocols. **PO4:** Investigation of network performance and reliability. **PO5:** Network simulation and analysis tools. **PO12:** Lifelong learning in wireless technologies. **PSO4:** Research applications in ad-hoc networks.
Minor (1)	**PO6, PSO3 - PO6:** Societal impact through wireless applications. **PSO3:** Mathematical models in network protocols.
No Mapping	**PO7, PO8, PO9, PO10, PO11** - No environmental, ethical, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/design, 20% analysis/evaluation - Wireless networks focus

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT751PE: Intrusion Detection Systems (Professional Elective – V)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT751PE.1	**Explain** computer security threats and intrusion detection concepts	2	Understand	Unit I
IT751PE.2	**Classify** network and application layer attacks and attacker profiles	2	Understand	Unit II
IT751PE.3	**Apply** signature-based detection using Snort tools	3	Apply	Unit III
IT751PE.4	**Analyze** anomaly detection algorithms and behavior monitoring	4	Analyze	Unit IV
IT751PE.5	**Evaluate** attack trees and correlation techniques for threat detection	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	1	-	2	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	1	-	2	-	-	-	1	3	2	2	2
CO3	3	3	2	3	3	1	-	2	-	-	-	1	3	3	2	2
CO4	3	3	3	3	3	1	-	2	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	1	-	2	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**2.4**	**1.0**	**-**	**2.0**	**-**	**-**	**-**	**1.4**	**3.0**	**2.6**	**2.0**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO8, PSO1 - PO1:** Comprehensive cybersecurity engineering knowledge and intrusion detection principles. **PO2:** Complex security threat analysis and detection challenges. **PO8:** Strong ethical considerations in security monitoring and privacy protection. **PSO1:** Computer security systems and network protection mechanisms.
Moderate (2)	**PO3, PO4, PO5, PO6, PO12, PSO2, PSO4 - PO3:** Design of detection systems and security architectures. **PO4:** Investigation of security incidents and threat patterns. **PO5:** Security tool usage including Snort and monitoring platforms. **PO6:** Societal impact through cyber threat protection. **PO12:** Lifelong learning in evolving security technologies. **PSO2:** Security software development. **PSO4:** Research applications in cybersecurity.
Minor (1)	**PSO3** - Mathematical models in anomaly detection algorithms.
No Mapping	**PO7, PO9, PO10, PO11** - No environmental, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 40% understanding concepts, 40% application/analysis, 20% evaluation - Cybersecurity focus with enhanced understanding level

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

IT752PE: Augmented Reality & Virtual Reality (Professional Elective – V)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT752PE.1	**Explain** AR/VR fundamentals and display technologies	2	Understand	Unit I
IT752PE.2	**Analyze** computer vision and interaction techniques	4	Analyze	Unit II
IT752PE.3	**Apply** visual perception and rendering principles	3	Apply	Unit III
IT752PE.4	**Design** cognitive models for immersive experiences	3	Apply	Unit IV
IT752PE.5	**Evaluate** motion tracking and audio rendering	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	1	-	-	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**2.4**	**0.2**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**2.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO2 - PO1:** Comprehensive AR/VR engineering knowledge and immersive technology principles. **PO2:** Complex interaction design and user experience problems. **PO5:** Extensive use of AR/VR development tools and platforms. **PSO1:** Computer graphics systems and visualization technologies. **PSO2:** Interactive software development for immersive applications.
Moderate (2)	**PO3, PO4, PO12, PSO4 - PO3:** Design of immersive experiences and interaction patterns. **PO4:** Investigation of user behavior and system performance. **PO12:** Lifelong learning in evolving AR/VR technologies. **PSO4:** Research applications in immersive computing.
Minor (1)	**PO6, PSO3 - PO6:** Societal impact through immersive technology applications. **PSO3:** Mathematical foundations in computer graphics.
No Mapping	**PO7, PO8, PO9, PO10, PO11** - No environmental, ethical, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/design, 20% analysis/evaluation - Immersive technology focus

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

CS754PE: Blockchain Technology (Professional Elective – V)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS754PE.1	**Explain** blockchain concepts and cryptocurrency fundamentals	2	Understand	Unit I
CS754PE.2	**Analyze** blockchain extensibility and digital identity concepts	4	Analyze	Unit II
CS754PE.3	**Apply** blockchain science concepts to various domains	3	Apply	Unit III
CS754PE.4	**Implement** tokenization and currency multiplicity	3	Apply	Unit IV
CS754PE.5	**Evaluate** technical challenges and regulatory aspects	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	1	-	2	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	1	-	2	-	-	-	1	3	2	2	2
CO3	3	3	3	3	2	1	-	2	-	-	-	2	3	3	2	3
CO4	3	3	3	3	2	1	-	2	-	-	-	2	3	3	2	3
CO5	3	3	3	3	2	2	-	3	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**1.8**	**1.2**	**-**	**2.2**	**-**	**-**	**-**	**1.6**	**3.0**	**2.6**	**2.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO8, PSO1 - PO1:** Comprehensive blockchain engineering knowledge and distributed ledger principles. **PO2:** Complex decentralized system problem analysis. **PO8:** Strong ethical considerations in cryptocurrency and smart contracts. **PSO1:** Distributed computer systems and consensus mechanisms.
Moderate (2)	**PO3, PO4, PO6, PO12, PSO2, PSO4 - PO3:** Design of blockchain applications and smart contracts. **PO4:** Investigation of blockchain performance and scalability. **PO6:** Societal impact through decentralized applications. **PO12:** Lifelong learning in evolving blockchain technologies. **PSO2:** Blockchain software development. **PSO4:** Research applications in distributed systems.
Minor (1)	**PO5, PSO3 - PO5:** Basic blockchain tool usage. **PSO3:** Cryptographic mathematics foundations.
No Mapping	**PO7, PO9, PO10, PO11** - No environmental, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/analysis, 20% evaluation - Blockchain technology focus

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

CS755PE: Software Process & Project Management (Professional Elective – V)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS755PE.1	**Explain** software process maturity models and frameworks	2	Understand	Unit I
CS755PE.2	**Analyze** software economics and lifecycle phases	4	Analyze	Unit II
CS755PE.3	**Apply** workflow planning and checkpoint processes	3	Apply	Unit III
CS755PE.4	**Design** project organizations and control mechanisms	3	Apply	Unit IV
CS755PE.5	**Evaluate** project metrics and future practices	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	1	1	1	2	2	2	3	2	2	3	1	2
CO2	2	3	2	2	1	1	1	2	2	2	3	2	2	3	1	2
CO3	2	3	3	3	2	1	1	2	3	3	3	2	2	3	1	3
CO4	2	3	3	3	2	1	1	2	3	3	3	2	2	3	1	3
CO5	2	3	3	3	2	2	1	2	3	3	3	3	2	3	1	3
Average	**2.0**	**2.8**	**2.6**	**2.6**	**1.6**	**1.2**	**1.0**	**2.0**	**2.6**	**2.6**	**3.0**	**2.2**	**2.0**	**3.0**	**1.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO11, PSO2 - PO11:** Comprehensive project management knowledge and software development methodologies. **PSO2:** End-to-end software process management and development lifecycle.
Moderate (2)	**PO2, PO3, PO4, PO8, PO9, PO10, PO12, PSO4 - PO2:** Problem analysis in project planning and resource allocation. **PO3:** Design of software processes and workflows. **PO4:** Investigation of project metrics and performance. **PO8:** Ethical considerations in project management. **PO9:** Teamwork and collaboration in project environments. **PO10:** Communication skills in project documentation and reporting. **PO12:** Lifelong learning in project management practices. **PSO4:** Research applications in software engineering processes.
Minor (1)	**PO1, PO5, PO6, PO7, PSO1, PSO3 - PO1:** Basic engineering knowledge application. **PO5:** Project management tool usage. **PO6:** Societal impact through project outcomes. **PO7:** Environmental considerations in project planning. **PSO1:** Computer system project contexts. **PSO3:** Basic mathematical project metrics.
No Mapping	-
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/analysis, 20% evaluation - Software management focus

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MR22 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR22 **Year/Sem: IV /II** **Department: IT**

IT861PE: Web & Database Security (Professional Elective – VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT861PE.1	**Explain** web security landscape and cryptography applications	2	Understand	Unit I
IT861PE.2	**Analyze** privacy protection techniques and server security	4	Analyze	Unit II
IT861PE.3	**Apply** database access control models and policies	3	Apply	Unit III
IT861PE.4	**Implement** security re-engineering for databases	3	Apply	Unit IV
IT861PE.5	**Evaluate** future trends in database privacy and security	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	1	-	2	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	1	-	2	-	-	-	1	3	3	2	2
CO3	3	3	3	3	3	1	-	2	-	-	-	2	3	3	2	3
CO4	3	3	3	3	3	1	-	2	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	2	-	3	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**2.4**	**1.2**	**-**	**2.2**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**2.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PO8, PSO1, PSO2 - PO1:** Comprehensive web and database security engineering knowledge. **PO2:** Complex security vulnerability analysis and protection mechanisms. **PO5:** Extensive security tool usage and database protection platforms. **PO8:** Strong ethical considerations in data privacy and access control. **PSO1:** Computer security systems and database protection. **PSO2:** Security software development for web applications.
Moderate (2)	**PO3, PO4, PO6, PO12, PSO4 - PO3:** Design of security architectures and access control systems. **PO4:** Investigation of security threats and vulnerability assessment. **PO6:** Societal impact through data protection and privacy. **PO12:** Lifelong learning in evolving security technologies. **PSO4:** Research applications in cybersecurity.
Minor (1)	**PSO3** - Cryptographic mathematics and security algorithms.
No Mapping	**PO7, PO9, PO10, PO11** - No environmental, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/analysis, 20% evaluation - Comprehensive security focus

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MR22 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR22 **Year/Sem: IV /II** **Department: IT**

IT862PE: Digital Forensics (Professional Elective – VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT862PE.1	**Explain** cybercrime types and digital forensics concepts	2	Understand	Unit I
IT862PE.2	**Analyze** forensic duplication and data collection methods	4	Analyze	Unit II
IT862PE.3	**Apply** forensic analysis and validation techniques	3	Apply	Unit III
IT862PE.4	**Evaluate** current forensic tools and investigation methods	4	Analyze	Unit IV
IT862PE.5	**Design** forensic procedures for mobile devices	3	Apply	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	1	-	3	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	1	-	3	-	-	-	1	3	3	2	2
CO3	3	3	2	3	3	1	-	3	-	-	-	2	3	3	2	3
CO4	3	3	3	3	3	1	-	3	-	-	-	2	3	3	2	3
CO5	3	3	3	3	3	2	-	3	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.2**	**2.4**	**2.4**	**1.2**	**-**	**3.0**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**2.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PO8, PSO1 - PO1:** Comprehensive digital forensics engineering knowledge and investigation principles. **PO2:** Complex forensic evidence analysis and recovery challenges. **PO5:** Extensive forensic tool usage and data recovery platforms. **PO8:** Strong ethical and legal considerations in digital evidence handling. **PSO1:** Computer forensic systems and investigation methodologies.
Moderate (2)	**PO3, PO4, PO6, PO12, PSO2, PSO4 - PO3:** Design of forensic procedures and investigation workflows. **PO4:** Investigation of digital evidence and crime patterns. **PO6:** Societal impact through cybercrime investigation. **PO12:** Lifelong learning in evolving forensic technologies. **PSO2:** Forensic software development and tool customization. **PSO4:** Research applications in digital forensics.
Minor (1)	**PSO3** - Mathematical analysis in data recovery algorithms.
No Mapping	**PO7, PO9, PO10, PO11** - No environmental, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/analysis, 20% evaluation - Digital investigation focus

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MR22 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR22 **Year/Sem: IV /II** **Department: IT**

CS862PE: Distributed Systems (Professional Elective – VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS862PE.1	**Explain** distributed system characteristics and models	2	Understand	Unit I
CS862PE.2	**Analyze** inter-process communication mechanisms	4	Analyze	Unit II
CS862PE.3	**Apply** remote invocation and object distribution	3	Apply	Unit III
CS862PE.4	**Design** distributed file systems and peer-to-peer networks	3	Apply	Unit IV
CS862PE.5	**Evaluate** transaction management and replication	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	2	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	2	2
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	3
CO5	3	3	3	3	2	-	-	-	-	-	-	2	3	3	2	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**2.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO1, PSO2 - PO1:** Comprehensive distributed systems engineering knowledge and architecture principles. **PO2:** Complex distributed computing problem analysis and scalability challenges. **PSO1:** Distributed computer systems and network architectures. **PSO2:** Distributed software development and system integration.
Moderate (2)	**PO3, PO4, PO5, PO12, PSO4 - PO3:** Design of distributed architectures and communication protocols. **PO4:** Investigation of system performance and reliability issues. **PO5:** Distributed computing tools and platforms. **PO12:** Lifelong learning in distributed technologies. **PSO4:** Research applications in distributed computing.
Minor (1)	**PSO3** - Mathematical models in distributed algorithms.
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11** - No societal, environmental, ethical, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/design, 20% analysis/evaluation - Distributed computing focus

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MR22 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR22 **Year/Sem: IV /II** **Department: IT**

CS863PE: Deep Learning (Professional Elective – VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS863PE.1	**Explain** artificial neural networks and basic models	2	Understand	Unit I
CS863PE.2	**Apply** unsupervised learning networks and algorithms	3	Apply	Unit II
CS863PE.3	**Implement** deep feedforward networks and backpropagation	3	Apply	Unit III
CS863PE.4	**Analyze** regularization methods for deep learning	4	Analyze	Unit IV
CS863PE.5	**Evaluate** optimization strategies for training deep models	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	2	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	3	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3	3
Average	**3.0**	**2.8**	**2.4**	**2.4**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3.0**	**2.8**	**3.0**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO1, PSO3 - PO1:** Comprehensive deep learning engineering knowledge and neural network principles. **PO2:** Complex pattern recognition problem analysis and model optimization. **PO5:** Extensive deep learning framework usage and AI tools. **PSO1:** AI computing systems and neural network architectures. **PSO3:** Advanced mathematical foundations of deep learning algorithms.
Moderate (2)	**PO3, PO4, PO12, PSO2, PSO4 - PO3:** Design of neural network architectures and learning models. **PO4:** Investigation of model performance and generalization. **PO12:** Lifelong learning in evolving AI technologies. **PSO2:** AI software development and model deployment. **PSO4:** Research applications in artificial intelligence.
Minor (1)	-
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11** - No societal, environmental, ethical, teamwork, communication, or project management focus.
Cognitive Range	**BTL 2-4** - 20% understanding concepts, 60% application/implementation, 20% analysis/evaluation - Advanced AI focus

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT862PE: Digital Forensics (Professional Elective – VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT611PE.1	**Explain** the fundamental concepts, architecture, and types of biometric systems along with performance measures and applications.	2	Understanding	Unit I: Introduction & Handwritten Character Recognition
IT611PE.2	**Analyze** various biometric technologies including face, retina, iris, vein, and fingerprint recognition systems and their working principles.	4	Analyzing	Unit II: Face, Retina & Iris Biometrics
IT611PE.3	**Evaluate** privacy concerns in biometric systems and apply cryptographic techniques for enhancing security in multimodal biometrics.	5	Evaluating	Unit III: Privacy & Biometric Cryptography
IT611PE.4	**Design** watermarking techniques for biometric data protection and assess their robustness against various attacks.	6	Creating	Unit IV: Watermarking Techniques & Biometrics
IT611PE.5	**Develop** image enhancement techniques and implement biometric standards for interoperable systems.	6	Creating	Unit V: Image Enhancement & Biometric Standards

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	1	-	1	-	1	-	1	2	1	1	1
CO2	2	3	2	2	2	1	-	1	-	2	-	2	2	2	2	2
CO3	2	3	2	3	2	2	-	3	-	2	-	2	2	2	2	2
CO4	2	2	3	2	2	1	-	2	-	2	-	2	2	3	2	3
CO5	2	2	3	2	2	2	-	2	-	2	-	2	2	3	2	3
Average	**2**	**2.4**	**2.2**	**2.2**	**1.8**	**1.4**	**–**	**1.8**	**–**	**1.8**	**–**	**1.8**	**2**	**2.2**	**1.8**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis)** - Strongly addressed through analysis of biometric technologies and their performance. **PSO-2 (Software Development)** - Key in developing biometric algorithms and systems. **PSO-4 (Research)** - Essential for designing new biometric techniques and standards.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO8 (Ethics), PO12 (Life-long Learning), PSO-1 (Computer Systems)** - Biometric principles, system design, experimental analysis, tool usage, ethical considerations, and continuous learning are consistently applied.
Minor (1)	**PO6 (Society), PO10 (Communication), PSO-3 (Mathematical Concepts)** - Societal impact, technical communication, and mathematical foundations are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management)** - Environmental aspects, collaborative work, and project management are not emphasized in this technical biometrics course.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from fundamental concepts to designing and developing biometric security solutions.

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT611OE: Java Programming (Open Elective – I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT611OE.1	**Apply** object-oriented programming principles to **develop** solutions for computational problems.	3	Apply	Unit I
IT611OE.2	**Implement** robust applications using exception handling and file input/output operations.	3	Apply	Unit II
IT611OE.3	**Develop** modular programs using packages and **manage** data collections efficiently.	3	Apply	Unit III
IT611OE.4	**Build** concurrent and database-connected applications using multithreading and JDBC.	4	Analyze	Unit IV
IT611OE.5	**Design** interactive desktop applications with graphical user interfaces using Swing.	6	Create	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	-	-	-	-	-	-	-	1	3	2	1	-
CO2	3	2	2	-	1	-	-	-	-	-	-	1	3	1	-	-
CO3	3	2	2	-	1	-	-	-	-	-	-	1	3	1	-	-
CO4	3	3	2	1	2	-	-	-	-	-	-	2	3	1	1	-
CO5	3	3	3	-	2	-	-	-	-	-	-	2	3	1	1	-
Average	**3.0**	**2.4**	**2.2**	**0.2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**1.4**	**3.0**	**1.2**	**0.6**	**-**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PSO2:** The course delivers core engineering knowledge of OOP and Java, forming the foundation for software development.
Moderate (2)	**PO2, PO3:** Students analyze problems to apply OOP concepts and design/develop software solutions.
Minor (1)	**PO5, PO12, PSO1, PSO3, PSO4:** Use of IDEs and JDBC; learning a complex language; foundational programming; logical thinking; application development.
No Mapping	**PO4, PO6, PO7, PO8, PO9, PO10, PO11:** No content on investigation, societal impact, ethics, teamwork, communication, or project management.
Cognitive Range	**BTL 3-6:** Appropriate progression from application to creation. **Distribution: L0% M80% H20%** (Good for Year 3).

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MR22 – Revised Course Outcome

B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

IT612OE: Object Oriented Programming using C++ (Open Elective – I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT612OE.1	**Utilize** C++ constructs and object-oriented principles to structure programs.	3	Apply	Unit I
IT612OE.2	**Implement** data abstraction by **designing** and using classes with constructors and destructors.	3	Apply	Unit II
IT612OE.3	**Develop** hierarchical software solutions using inheritance and runtime polymorphism.	4	Analyze	Unit III
IT612OE.4	**Implement** custom I/O operations and **extend** language functionality through operator overloading.	3	Apply	Unit IV
IT612OE.5	**Build** robust applications by **incorporating** exception handling mechanisms.	3	Apply	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	-	-	-	-	-	-	-	1	3	2	1	-
CO2	3	2	2	-	-	-	-	-	-	-	-	1	3	1	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	1	1	-
CO4	3	2	2	-	-	-	-	-	-	-	-	1	3	1	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	1	3	1	-	-
Average	**3.0**	**2.2**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.2**	**3.0**	**1.2**	**0.4**	**-**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PSO2:** Provides deep knowledge of C++ and OOP, a fundamental software development skill.
Moderate (2)	**PO2, PO3, PSO1:** Analyzing problems for OOP solutions, designing class hierarchies, and foundational programming.
Minor (1)	**PO12, PSO3, PSO4:** Learning a complex language; logical structuring; basic application development.
No Mapping	**PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11:** No investigation, modern tools, societal impact, ethics, teamwork, communication, or project management.
Cognitive Range	**BTL 3-4:** Focused on application and analysis. **Distribution: L0% M100% H0%** (Could be improved with higher-order tasks).

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MR22 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR22 **Year/Sem: VI /I** **Department: IT**

IT721OE: Full Stack Development (Open Elective – II)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT721OE.1	**Explain** the architecture of full-stack web applications and the role of components like Node.js, MongoDB, Express, React, and Angular.	2	Understand	Unit I
IT721OE.2	**Develop** server-side applications using Node.js to handle file systems, streams, and implement HTTP/HTTPS services.	3	Apply	Unit II
IT721OE.3	**Implement** data models and perform CRUD operations using MongoDB for managing data in web applications.	3	Apply	Unit III
IT721OE.4	**Build** server-side APIs using Express.js and construct dynamic user interfaces using Angular.	3	Apply	Unit IV
IT721OE.5	**Design** interactive and stateful user interfaces by implementing React components, lifecycle methods, and routing.	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	1	-	-	-	-	-	-	1	2	2	1	-
CO2	3	2	2	-	2	-	-	-	-	-	-	1	3	2	1	-
CO3	3	2	2	-	2	-	-	-	-	-	-	1	3	3	1	-
CO4	3	3	3	-	2	-	-	-	-	-	-	2	3	2	2	-
CO5	3	3	3	-	2	-	-	-	-	-	-	2	3	2	2	-
Average	**3**	**2.4**	**2.2**	**–**	**1.8**	**–**	**–**	**–**	**–**	**–**	**–**	**1.4**	**2.8**	**2.2**	**1.4**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PSO2:** Provides comprehensive knowledge of modern full-stack technologies (PO1) and develops core software development skills for web applications (PSO2).
Moderate (2)	**PO2, PO3, PO5, PSO3:** Students analyze requirements to select technologies (PO2), design and develop solutions (PO3), use development tools and frameworks (PO5), and apply data modeling concepts (PSO3).
Minor (1)	**PSO1, PSO4:** Provides a foundational understanding of web system architecture (PSO1) and applies computing concepts to build applications (PSO4).
No Mapping	**PO4, PO6, PO7, PO8, PO9, PO10, PO11, PO12:** The syllabus does not include investigation of complex problems, societal impact, ethics, teamwork, communication, project management, or life-long learning.
Cognitive Range	**BTL 2-4:** The course focuses on Understanding, Application, and Analysis. To meet the 30-60-10 target, it should incorporate a Remembering (BTL 1) and an Evaluating/Creating (BTL 5-6) outcome.

MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: VI /I** **Department: IT**

IT722OE: Scripting Languages (Open Elective – II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT722OE.1	**Develop** web applications and graphical interfaces using Ruby, Rails, and the Ruby Tk toolkit.	3	Apply	Unit I
IT722OE.2	**Extend** Ruby applications by **integrating** C libraries and **embedding** the Ruby interpreter in other languages.	6	Create	Unit II
IT722OE.3	**Differentiate** scripting from system programming and **implement** Perl scripts using its fundamental constructs.	4	Analyze	Unit III
IT722OE.4	**Build** complex Perl applications by **utilizing** advanced features like modules, objects, and internet-aware functionalities.	3	Apply	Unit IV
IT722OE.5	**Create** system administration scripts and graphical interfaces by **applying** TCL fundamentals and the Tk toolkit.	6	Create	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	2	-	-	-	-	-	-	1	3	1	1	-
CO2	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3	-
CO3	3	3	2	-	-	-	-	-	-	-	-	1	2	2	1	-
CO4	3	2	2	-	2	-	-	-	-	-	-	1	3	1	1	-
CO5	3	2	2	-	2	-	-	-	-	-	-	1	3	1	1	-
Average	**3**	**2.4**	**2.2**	**0.4**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**1.2**	**2.8**	**1.4**	**1.4**	**-**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PSO2:** Provides comprehensive knowledge of multiple scripting languages (PO1) and practical application development skills (PSO2).
Moderate (2)	**PO2, PO3, PO5:** Analyzing problems for scripting solutions, designing integrated systems, and using various programming tools and interpreters (PO5).
Minor (1)	**PO4, PSO1, PSO3, PSO4:** Investigation in language integration (PO4), foundational programming concepts (PSO1), logical structuring (PSO3), and research applications (PSO4).
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11, PO12:** No content on societal impact, environment, ethics, teamwork, communication, project management, or life-long learning.
Cognitive Range	**BTL 3-6:** Excellent focus on application, analysis, and creation. **Distribution: L0% M60% H40%**

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MR22 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR22 **Year/Sem: IV /II** **Department: IT**

IT831OE: Introduction to Big Data Technologies ((Open Elective – III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT831OE.1	**Explain** the fundamental characteristics of Big Data and the roles of Hadoop and cloud computing.	2	Understand	Unit I
IT831OE.2	**Analyze** the Hadoop ecosystem and **demonstrate** the use of HDFS, MapReduce, and YARN.	4	Analyze	Unit II
IT831OE.3	**Employ** Hive for SQL-like querying and Pig for data flow scripting to analyze large datasets.	3	Apply	Unit III
IT831OE.4	**Design** workflow pipelines using Oozie and **compare** various NoSQL data models.	5	Evaluate	Unit IV
IT831OE.5	**Implement** data coordination services using ZooKeeper and data transfer using Sqoop.	3	Apply	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	1	-	-	-	-	-	-	1	2	3	2	-
CO2	3	3	2	1	3	-	-	-	-	-	-	2	2	3	2	-
CO3	3	3	2	-	3	-	-	-	-	-	-	1	2	2	2	-
CO4	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3	-
CO5	3	3	2	1	3	-	-	-	-	-	-	2	2	2	2	-
Average	**3.0**	**2.8**	**2.0**	**0.8**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**2.2**	**2.4**	**2.2**	**-**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PO5, PSO3:** Comprehensive knowledge of Big Data frameworks (PO1), analytical evaluation of technologies (PO2), use of modern tools (PO5), and distributed computing models (PSO3).
Moderate (2)	**PO3, PO4, PSO2, PSO4:** Designing data pipelines and models (PO3), investigating NoSQL and system configurations (PO4), developing data-intensive applications (PSO2), relevance to modern computing applications (PSO4).
Minor (1)	**PO12, PSO1:** Continuous learning in evolving field (PO12), understanding distributed system architecture (PSO1).
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11:** No coverage of societal impact, sustainability, ethics, teamwork, communication, or project management.
Cognitive Range	**BTL 2-5:** Excellent cognitive spread from Understanding to Evaluation. **Distribution: L20% M60% H20%**

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MR22 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR22 **Year/Sem: IV /II** **Department: IT**

IT832OE: Introduction to DevOps (Open Elective – III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT832OE.1	**Explain** the principles of DevOps, Agile, and ITIL frameworks and the concept of continuous delivery.	2	Understand	Unit I
IT832OE.2	**Analyze** the influence of DevOps on software architecture, including microservices and resilience.	4	Analyze	Unit II
IT832OE.3	**Implement** source code management using Git and containerization with Docker.	3	Apply	Unit III
IT832OE.4	**Build** continuous integration pipelines using Jenkins and manage infrastructure as code.	3	Apply	Unit IV
IT832OE.5	**Evaluate** automated testing and deployment tools for improving software quality and reliability.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	1	-	-	-	-	-	1	1	2	1	1	-
CO2	3	3	3	1	2	-	-	-	-	-	-	1	2	3	1	2
CO3	3	2	2	-	3	-	-	-	-	-	-	1	2	3	1	1
CO4	3	2	2	-	3	-	-	-	-	-	1	1	2	3	1	1
CO5	3	3	2	1	3	-	-	-	-	-	1	2	3	3	1	2
Average	**3.0**	**2.4**	**2.0**	**0.4**	**2.4**	**-**	**-**	**-**	**-**	**-**	**0.6**	**1.2**	**1.4**	**2.8**	**1.0**	**1.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO5, PSO2:** Foundational knowledge of DevOps practices (PO1), extensive use of automation tools (PO5), core software development lifecycle skills (PSO2).
Moderate (2)	**PO2, PO3, PO11, PO12:** Analyzing software delivery challenges (PO2), designing pipelines and architectures (PO3), project management through pipeline orchestration (PO11), continuous learning of new tools (PO12).
Minor (1)	**PO4, PSO1, PSO4:** Investigating tool efficacy (PO4), understanding system operations (PSO1), applying DevOps to IT problems (PSO4).
No Mapping	**PO6, PO7, PO8, PO9, PO10:** No coverage of societal impact, environment, ethics, teamwork, or communication.
Cognitive Range	**BTL 2-5:** Strong cognitive spread from Understanding to Evaluation. **Distribution: L20% M60% H20%**

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MR22 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR22 **Year/Sem: III /II** **Department: IT**

ME622OE: Renewable Energy Sources (Open Elective)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
ME622OE.1	**Describe** the global and national energy scenario and **explain** the need for renewable energy development.	2	Understand	Unit I
ME622OE.2	**Identify** the principles of solar energy conversion and **list** the components of solar thermal and photovoltaic systems.	1	Remember	Unit II
ME622OE.3	**Apply** the principles of wind energy conversion to **calculate** the power potential for a given site.	3	Apply	Unit III
ME622OE.4	**Classify** biomass resources and **apply** the principles of different biomass conversion processes.	3	Apply	Unit IV
ME622OE.5	**Explain** the working principles of ocean, geothermal, and small hydro energy systems.	2	Understand	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	3	3	1	-	-	-	2	-	-	-	2
CO2	3	1	-	-	-	1	1	-	-	-	-	1	2	-	-	1
CO3	3	2	1	-	-	2	2	-	-	-	-	1	2	1	-	1
CO4	3	2	1	-	-	2	2	-	-	-	-	1	2	1	-	1
CO5	3	2	-	-	-	2	2	-	-	-	-	1	2	-	-	1
Average	**3.0**	**1.8**	**0.4**	**-**	**-**	**2.0**	**2.0**	**0.2**	**-**	**-**	**-**	**1.2**	**2.0**	**0.4**	**-**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO6, PO7:** Provides fundamental engineering knowledge of renewable energy systems (PO1). Directly addresses environmental sustainability and societal impact (PO6, PO7).
Moderate (2)	**PO2, PSO1:** Involves problem analysis related to energy potential and system selection (PO2). Covers foundational principles of energy engineering systems (PSO1).
Minor (1)	**PO3, PO8, PO12, PSO2, PSO4:** Light design aspects in system application (PO3), introduces ethical energy use (PO8), fosters life-long learning in a critical field (PO12), applies basic engineering principles (PSO2), and connects to energy application contexts (PSO4).
No Mapping	**PO4, PO5, PO9, PO10, PO11, PSO3:** No content on investigation, modern tool usage, teamwork, communication, project management, or advanced mathematical concepts.
Cognitive Range	**BTL 1-3:** Focuses on Remembering, Understanding, and Applying concepts. **Distribution: L60% M40% H0%** (Aligns closely with the 40-60-0 target, slightly high on Lower Order).

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MR22 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR22 **Year/Sem: IV /I** **Department: IT**

CE722OE: Solid Waste Management (Open Elective)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CE722OE.1	**Define** solid waste and **explain** the elements of integrated solid waste management as per Indian regulations.	2	Understand	Unit I
CE722OE.2	**Describe** the engineering systems for solid waste collection, storage, and transportation.	2	Understand	Unit II
CE722OE.3	**Apply** processing techniques for resource and energy recovery from solid waste through composting and thermal conversion.	3	Apply	Unit III
CE722OE.4	**Analyze** landfill design considerations and **evaluate** leachate control methods.	4	Analyze	Unit IV
CE722OE.5	**Classify** hazardous wastes and **explain** their disposal methods, including biomedical and e-waste management.	2	Understand	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	3	3	2	-	-	-	1	2	-	-	1
CO2	3	2	1	-	-	2	2	1	-	-	-	1	2	1	-	1
CO3	3	2	2	-	-	2	2	1	-	-	-	1	2	2	-	1
CO4	3	3	2	1	-	2	2	1	-	-	-	1	3	2	-	1
CO5	3	2	-	-	-	3	3	2	-	-	-	1	2	-	-	1
Average	**3.0**	**2.2**	**1.0**	**0.2**	**-**	**2.4**	**2.4**	**1.4**	**-**	**-**	**-**	**1.0**	**2.2**	**1.0**	**-**	**1.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO6, PO7:** Provides fundamental engineering knowledge of waste management systems (PO1). Directly addresses public health, safety, and environmental sustainability (PO6, PO7).
Moderate (2)	**PO2, PO8, PSO1:** Involves problem analysis in waste collection and treatment (PO2), emphasizes professional ethics in waste disposal (PO8), and covers core civil engineering environmental systems (PSO1).
Minor (1)	**PO3, PO12, PSO2, PSO4:** Basic design of waste processing systems (PO3), fosters life-long learning in evolving environmental regulations (PO12), applies engineering principles (PSO2), and addresses societal applications (PSO4).
No Mapping	**PO4, PO5, PO9, PO10, PO11, PSO3:** No content on complex investigations, modern tool usage, teamwork, communication, project management, or advanced mathematical concepts.
Cognitive Range	**BTL 2-4:** Focuses on Understanding, Applying, and Analyzing concepts. **Distribution: L60% M40% H0%** (Aligns closely with the 40-60-0 target, slightly high on Lower Order).

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MR21 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR21 **Year/Sem: I / I** **Department: IT**

EN101HS: English

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Unit
EN101HS.1	**Apply** principles of word formation, prefixes, suffixes, and grammatical rules to **construct** grammatically correct sentences and paragraphs.	3	**Applying**	Unit I
EN101HS.2	**Comprehend** and **interpret** descriptive and technical texts, and **write** clear definitions, descriptions, and classifications using appropriate vocabulary and style.	2	**Understanding**	Unit II
EN101HS.3	**Prepare** formal letters, applications, and resumes using proper format, style, and language conventions for professional communication.	3	**Applying**	Unit III
EN101HS.4	**Compose** well-structured essays and précis with coherent introductions, conclusions, and logical flow of ideas.	3	**Applying**	Unit IV
EN101HS.5	**Develop** technical reports with clear structure, appropriate format, and precise technical vocabulary for engineering contexts.	3	**Applying**	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	-	-	-	-	-	-	-	2	1	3	-	2	-	1	-	2
CO2	-	-	-	-	-	1	-	1	1	2	-	2	-	1	-	1
CO3	-	-	-	-	-	1	-	2	2	3	-	2	-	2	-	3
CO4	-	-	-	-	-	1	-	1	2	3	-	2	-	2	-	3
CO5	-	-	-	-	-	2	-	2	2	3	-	3	-	2	-	3
Average	**–**	**–**	**–**	**–**	**–**	**1**	**–**	**1.6**	**1.6**	**2.8**	**–**	**2.2**	**–**	**1.6**	**–**	**2.4**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO10 (Communication)** - Strongly addressed through all aspects of written and verbal communication, technical reporting, and presentation skills.
Moderate Contribution (2 – Moderate)	**PO8 (Ethics), PO12 (Life-long Learning), PSO-4 (Research)** - Ethical communication, continuous learning in language skills, and research documentation are consistently applied.
Minor Contribution (1 – Slight)	**PO6 (Society), PO9 (Teamwork), PSO-2 (Software Development)** - Societal communication, collaborative writing, and technical documentation are partially addressed.
No Direct Mapping	**PO1, PO2, PO3, PO4, PO5, PO7, PO11, PSO-1, PSO-3** - Technical engineering knowledge, problem analysis, design, investigations, tools, environment, project management, computer systems, and mathematical concepts are not directly related to language skills.
Cognitive Alignment	**BTL 2–3 (Understanding → Applying)** - Appropriate focus on comprehension and application of language skills for engineering communication.

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MR21 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR21 **Year/Sem:** I / I **Department:** IT

MA101BS – Mathematics-I

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Unit
MA101BS.1	**Apply** matrix methods to **solve** systems of linear equations and **analyze** their consistency using rank concepts.	**3–4**	**Applying → Analyzing**	Unit I
MA101BS.2	**Determine** eigenvalues and eigenvectors and **transform** quadratic forms to canonical form using orthogonal transformations.	**3**	**Applying**	Unit II
MA101BS.3	**Analyze** convergence of sequences and series using standard convergence tests.	**4**	**Analyzing**	Unit III
MA101BS.4	**Evaluate** improper integrals and **apply** Beta and Gamma functions to solve engineering problems.	**3**	**Applying**	Unit IV
MA101BS.5	**Compute** partial derivatives and **determine** extreme values of multivariable functions using Lagrange multipliers.	**4**	**Analyzing**	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	–	2	–	–	–	–	–	–	–	1	–	–	3	–
CO2	3	3	–	2	–	–	–	–	–	–	–	1	–	–	3	–
CO3	2	3	–	3	–	–	–	–	–	–	–	1	–	–	3	–
CO4	3	2	–	3	–	–	–	–	–	–	–	1	–	–	3	–
CO5	3	3	–	3	–	–	–	–	–	–	–	2	–	–	3	–
Average	2.8	2.8	-	2.6	-	-	-	-	-	-	-	1.2	-	-	3	-

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1, PO2, PO4, PSO-3** → The course builds solid analytical and computational mathematics foundations for engineering and IT applications.
Moderate Contribution (2 – Moderate)	Minor link with **PO12** → Promotes continued mathematical learning.
Minor Contribution (1 – Slight)	PO12 shows slight link to continuous learning aspect.
No Mapping	POs 3, 5–11 and PSO-1, PSO-2, PSO-4 not directly related.
Cognitive Alignment	BTL **3–4 (Applying → Analyzing)** — ideal cognitive spread for a first-year Engineering Mathematics course.

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MR21 – Revised Course Outcome
B.Tech. I Semester
Regulation: MR21 **Year/Sem: I / I** **Department: IT**

CH101BS – Chemistry

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

CO Code	Course Outcome AVG	BTL	Cognitive Domain (Keyword)	Linked Unit
CH101BS.1	**Explain** the causes, effects, and treatment methods of water hardness for domestic and industrial purposes.	2	**Understanding**	Unit I
CH101BS.2	**Apply** the principles of electrochemistry and corrosion to design batteries and corrosion control systems.	3	**Applying**	Unit II
CH101BS.3	**Analyze** the characteristics of fuels and **apply** combustion and lubrication principles in engineering applications.	4	**Analyzing**	Unit III
CH101BS.4	**Compare** different engineering materials including polymers, refractories and nanomaterials based on their properties and applications.	4	**Analyzing**	Unit IV
CH101BS.5	**Interpret** spectroscopic data (UV–Vis, IR, NMR) to identify material composition and structure.	4	**Analyzing**	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	2	1	-	-	-	2	2	-	-	-	-	-	-	-	1	-
CO2	3	2	2	-	-	1	1	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	1	2	-	-	-	-	-	-	-	3	-
CO4	3	2	2	-	-	-	1	-	-	-	-	-	-	-	3	1
CO5	3	2	-	2	2	-	-	-	-	-	-	1	-	-	2	2
Average	**2.8**	**2**	**1**	**0.4**	**0.4**	**0.8**	**1.2**	**–**	**–**	**–**	**–**	**0.2**	**–**	**–**	**2.2**	**0.6**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1 (Engineering Knowledge):** Provides core chemical principles essential for engineering applications. **PSO-3 (Mathematical Concepts):** Strong application in fuel analysis, material selection, and spectroscopic interpretation.
Moderate Contribution (2 – Moderate)	**PO2 (Problem Analysis):** Analyzing corrosion mechanisms, fuel efficiency, and material performance. **PO3 (Design):** Designing corrosion control systems and battery configurations. **PO6/PO7 (Society/Environment):** Addressing water treatment, environmental impacts, and sustainable energy.
Minor Contribution (1 – Slight)	**PO4/PO5 (Investigations/Tools):** Experimental methods in spectroscopy and material characterization. **PO12 (Life-long Learning):** Foundation in chemical principles for continuous learning. • **PSO-4 (Research Ability):** Material analysis and characterization skills development.
No Mapping	**PO8, PO9, PO10, PO11, PSO-1, PSO-2:** No direct correlation with ethics, teamwork, communication, management, computer systems, or software development.
Cognitive Alignment	**BTL 2-4:** Clear progression from Understanding → Applying → Analyzing chemical systems and materials.

MR21 – Revised Course Outcome
B.Tech. I Semester
Regulation: MR21 **Year/Sem: I / I** **Department: IT**

EE101ES – Basic Electrical Engineering

Course Outcomes

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

CO Code	Course Outcome AVG	BTL	Cognitive Domain (Keyword)	Linked Unit AVG
EE101ES.1	**Analyze** and **solve** D.C. electrical circuits using Ohm's Law, Kirchhoff's Laws, and network theorems.	4	**Analyzing**	Unit I – D.C. Circuits
EE101ES.2	**Examine** and **evaluate** single-phase A.C. circuits with sinusoidal excitation to determine impedance, power, and power factor.	4	**Analyzing**	Unit II – A.C. Circuits
EE101ES.3	**Explain** the construction, working principles, and performance characteristics of single-phase transformers.	3–4	**Applying → Analyzing**	Unit III – Transformers
EE101ES.4	**Describe** and **analyze** the operating principles and characteristics of D.C., induction, and synchronous machines.	3–4	**Applying → Analyzing**	Unit IV – Electrical Machines
EE101ES.5	**Identify** components of low-voltage electrical installations, **calculate** energy consumption, and **recommend** power factor improvement methods.	3–5	**Applying → Evaluating**	Unit V – Electrical Installations

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	2	2	2	–	–	–	–	–	–	1	–	–	3	–
CO2	3	3	2	2	2	–	–	–	–	–	–	1	–	–	3	–
CO3	3	2	3	2	3	2	2	–	–	–	–	1	–	–	3	–
CO4	2	2	2	–	2	3	2	–	–	–	–	1	–	–	3	–
CO5	3	3	2	2	3	3	2	–	–	–	–	2	–	–	3	2
Average	2.8	2.6	2.2	1.6	2.4	1.6	1.2	-	-	-	-	1.2	-	-	3	0.4

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1, PO2, PSO-3** → Develops analytical and mathematical foundations for electrical systems.
Moderate Contribution (2 – Moderate)	**PO3, PO4, PO5, PO6, PO7, PSO-4** → Supports design, investigation, safety, sustainability, and interdisciplinary understanding.
Minor Contribution (1 – Slight)	**PO12** → Encourages continual learning of electrical principles and tools.
No Mapping	POs 8–11, PSO-1, PSO-2 not directly relevant to this core course.
Cognitive Alignment	BTL **3–5 (Applying → Evaluating)** — reflects progressive depth across the syllabus.

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MR21 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR21 **Year/Sem:** I / I **Department:** IT

ME151ES: Engineering Workshop

Course Outcomes

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

CO Code	Revised Outcome (One per Unit / Trade)	BTL	Cognitive Domain (Keyword)	Linked Unit / Workshop Module
ME151ES.1	**Identify** the tools, materials, operations, and safety procedures associated with basic workshop trades.	2	Understand	Carpentry, Fitting, Tin-smithy, Foundry, Welding, House-wiring, Blacksmithy
ME151ES.2	**Apply** appropriate tools and fundamental workshop processes to carry out fabrication, machining, and assembly tasks.	3	Apply	Carpentry, Fitting, Tin-smithy, Foundry, Welding, House-wiring, Blacksmithy
ME151ES.3	**Evaluate** the accuracy, functionality, and safety of completed workshop tasks across different trades.	5	Evaluate	Carpentry, Fitting, Tin-smithy, Foundry, Welding, House-wiring, Blacksmithy

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	2	1	–	–	2	1	–	–	1	1	–	1	–	–	1	–
CO2	3	2	1	1	3	1	–	–	1	1	–	1	–	–	1	–
CO3	2	2	2	1	3	1	–	1	1	1	–	1	–	–	1	–
Average	**2.3**	**1.6**	**1.0**	**0.6**	**2.6**	**1.0**	–	**0.3**	**1.0**	**1.0**	–	**1.0**	–	–	**1.0**	–

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1, PO5** → Workshop lab strongly builds engineering fundamentals, tool handling skills, measurement abilities, and safe operation of workshop equipment across all trades.
Moderate Contribution (2 – Moderate)	**PO2, PO3, PO4, PO9, PO10, PSO-3** → Students analyze dimensions, select processes, develop joints/circuits/moulds, inspect workmanship, coordinate in teams, and communicate measurements and safety steps.
Minor Contribution (1 – Slight)	**PO6, PO8, PO12** → Students follow safety, ethical tool handling, and learn hands-on skills that promote lifelong practical learning.
No Mapping	**PO7, PO11, PSO-1, PSO-2, PSO-4** → These outcomes do not directly relate to mechanical workshop operations or basic fabrication/trade skills.
Cognitive Alignment	**BTL 2 → CO1 (Understand), BTL 3 → CO2 (Apply), BTL 5 → CO3 (Evaluate)** — fully aligned with practical, skill-centered workshop learning requirements.

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MR21 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR21 **Year/Sem:** I / I **Department:** IT

EN151HS – The English Language and Communication Skills Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Coverage / Focus Area
EN151HS.1	**Recognize** and **produce** correct pronunciation, stress, and intonation patterns through phonetic and listening practice, thereby improving auditory discrimination and spoken accuracy.	2 – 3	**Understanding → Applying**	Phonetics & Listening Modules
EN151HS.2	**Participate** effectively in **group discussions, JAM sessions, and role-plays** to build fluency, confidence, and interpersonal communication skills.	3	**Applying**	Speaking & Interactive Modules
EN151HS.3	**Prepare** professional and academic documents—such as **résumés, reports, and e-mails**—and **present** them with clarity, coherence, and proper etiquette.	3	**Applying**	Reading & Writing Modules

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	–	–	–	–	–	–	–	2	2	3	–	2	–	2	–	2
CO2	–	–	–	–	–	–	–	2	3	3	–	2	–	2	–	3
CO3	–	–	–	–	–	–	–	2	2	3	–	3	–	3	–	3
Average	-	-	-	-	-	-	-	2	2.33	3	-	2.33	-	2.33	-	2.67

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO10** & **PSO-4** → Course directly builds communication and presentation skills for professional contexts.
Moderate Contribution (2 – Moderate)	**PO8, PO9, PO12, PSO-2** → Encourages ethical team interaction and lifelong learning through communication practice.
Cognitive Alignment	BTL 2–3 → Practical application and performance-based learning typical for ELCS Lab.

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MR21 – Revised Course Outcome
B.Tech. I Semester

Regulation: MR21 **Year/Sem:** I / I **Department:** IT

CH151BS – Engineering Chemistry Lab

Course Outcomes

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

CO Code	Course Outcome (Comprehensive)	BTL	Cognitive Domain (Keyword)	Coverage (Experiment Groups)
CH151BS.1	**Estimate** chemical parameters such as hardness, alkalinity, acidity, and chloride content of water and **analyze** their significance for engineering applications.	**3–4**	**Applying → Analyzing**	Water analysis experiments
CH151BS.2	**Determine** concentration and strength of various acids, bases, and salts through **conductometric, potentiometric, and pH-metric** titrations, and **interpret** the obtained data.	**3–4**	**Applying → Analyzing**	Conductometric, potentiometric & pH-metric titrations
CH151BS.3	**Measure** physical properties (viscosity, surface tension, pH), **estimate** metal ions, and **demonstrate** synthesis of polymers and nanomaterials with awareness of safety and environmental practices.	**3**	**Applying**	Physical property, metal ion estimation, polymer/nano synthesis

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	2	2	–	2	–	–	–	–	–	1	–	–	–	2
CO2	3	3	3	3	–	2	–	–	–	–	–	1	–	–	–	2
CO3	3	2	3	2	–	3	2	–	–	–	–	1	–	–	–	2
Average	3	2.67	2.67	2.33	–	2.33	0.67	–	–	–	–	1	–	–	–	2

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1, PO2, PO3** → Students apply scientific and engineering fundamentals to perform and analyze experiments.
Moderate Contribution (2 – Moderate)	**PO4, PO6, PSO-4** → Lab builds investigative thinking, environmental awareness, and research readiness.
Minor Contribution (1 – Slight)	**PO12** → Encourages ongoing scientific learning and safe laboratory practices.
No Mapping	POs 5, 7–11, PSO-1–2, PSO-3 not directly relevant.
Cognitive Alignment	BTL **3–4** — ensures higher-order skills (analysis, data interpretation, application).

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EE151ES – Basic Electrical Engineering Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Coverage / Focus Area
EE151ES.1	**Verify** basic electrical laws and **measure** electrical quantities such as current, voltage, resistance, and power using appropriate instruments.	3	Applying	Verification of Ohm's law, KVL, KCL, resistance measurements, power calculations
EE151ES.2	**Determine** circuit parameters and performance characteristics of DC and AC networks and **analyze** their behavior under various load conditions.	3–4	Applying → Analyzing	Series/parallel DC & AC circuits, resonance, three-phase measurements
EE151ES.3	**Test** and **evaluate** the performance of electrical machines and **demonstrate** safe working practices in laboratory operations.	3–4	Applying → Analyzing	DC machines, transformers, earthing & safety experiments

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	3	3	2	2	3	3	–	–	–	–	–	1	2	–	2	–
CO2	3	3	3	3	3	2	–	–	–	–	–	1	2	–	3	2
CO3	3	3	3	3	3	3	–	–	–	–	–	1	2	–	3	2
Average	3.0	3.0	2.7	2.7	3.0	2.7	–	–	–	–	–	1.0	2.0	–	2.7	2.0

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1, PO2, PO3, PO4, PO5, PO6, PSO-3** → Develops core measurement, experimental, analytical, and safety skills.
Moderate Contribution (2 – Moderate)	**PSO-1, PSO-4** → Relates hardware fundamentals and interdisciplinary analysis to computing applications.
Minor Contribution (1 – Slight)	**PO12** → Encourages lifelong learning and good laboratory documentation.
No Mapping	POs 7–11 not directly relevant.
Cognitive Alignment	BTL 3–4 — Applies theoretical concepts and analyzes practical behavior of circuits and machines.

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MA202BS: Mathematics-II

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Linked Unit
MA202BS.1	**Solve** first-order ordinary differential equations and **apply** them to real-world problems such as Newton's law of cooling and natural growth/decay.	3	**Applying**	Unit I
MA202BS.2	**Solve** higher-order linear differential equations using methods like variation of parameters and **handle** variable coefficient cases such as Legendre's and Cauchy-Euler equations.	3	**Applying**	Unit II
MA202BS.3	**Evaluate** double and triple integrals and **apply** them to compute area and volume.	3	**Applying**	Unit III
MA202BS.4	**Analyze** vector fields using gradient, divergence, curl, and directional derivatives, and **interpret** their physical significance.	4	**Analyzing**	Unit IV
MA202BS.5	**Apply** vector integration theorems (Green's, Stokes', Gauss) to **evaluate** line, surface, and volume integrals.	3	**Applying**	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	-	-	-	-	-	-	-	1	2	1	3	1
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	1	3	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1	2	1	3	1
CO4	3	3	2	-	-	-	-	-	-	-	-	1	2	1	3	1
CO5	3	3	2	-	-	-	-	-	-	-	-	1	2	1	3	1
Average	**3.0**	**2.6**	**2.0**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**1.0**	**2.0**	**1.0**	**3.0**	**1.0**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1 (Engineering Knowledge), PSO-3 (Mathematical Modeling)** - Core mathematical concepts directly support engineering fundamentals and analytical modeling.
Moderate Contribution (2 – Moderate)	**PO2 (Problem Analysis), PO3 (Design/Development), PSO-1 (Core CS Concepts)** - Differential equations and vector calculus support problem-solving and algorithm design.
Minor Contribution (1 – Slight)	**PO12 (Life-long Learning), PSO-2 (Software Development), PSO-4 (Research)** - Provides foundational skills for continuous learning and computational applications.
No Direct Mapping	**PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11** - Investigation, tools, society, ethics, teamwork, communication, project management, and environment are not directly addressed.
Cognitive Alignment	**BTL 3–4 (Applying → Analyzing)** - Strong emphasis on applying mathematical techniques and analyzing vector fields and integrals.

MR21 – Revised Course Outcome
B.Tech. II Semester

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PH202BS: Applied Physics

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain	Linked Unit
PH202BS.1	**Explain** the principles of quantum mechanics and **solve** problems related to particle in a 1-D box and Heisenberg's uncertainty principle.	2	**Understanding**	Unit I
PH202BS.2	**Analyze** semiconductor physics and **evaluate** the characteristics of p-n junction diodes, Zener diodes, and BJTs.	4	**Analyzing**	Unit II
PH202BS.3	**Explain** the working principles of optoelectronic devices such as LEDs, photodiodes, and solar cells, and **interpret** their characteristics.	2	**Understanding**	Unit III
PH202BS.4	**Describe** the operation of lasers and optical fibers and **analyze** their applications in engineering and communication.	2	**Understanding**	Unit IV
PH202BS.5	**Interpret** dielectric and magnetic properties of materials and **relate** them to engineering applications.	2	**Understanding**	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3	PSO-4
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	2	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1	2	1	2	1
CO3	2	2	1	-	-	-	-	-	-	-	-	1	1	1	1	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1	1	1	1	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1	1	-	1	1
Average	**2.2**	**1.4**	**0.4**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**1.0**	**1.2**	**0.6**	**1.4**	**1.0**

Justification

Aspect	Observation & Reasoning
Major Contribution (3 – Strong)	**PO1 (Engineering Knowledge)** - Provides foundational physics knowledge essential for engineering applications.
Moderate Contribution (2 – Moderate)	**PO2 (Problem Analysis), PSO-3 (Mathematical Modeling)** - Supports analysis of physical systems and basic modeling.
Minor Contribution (1 – Slight)	**PO3 (Design), PO12 (Life-long Learning), PSO-1 (Core CS), PSO-2 (Software Dev), PSO-4 (Research)** - Indirect support for design, learning, and research.
No Direct Mapping	**PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11** - Tools, society, environment, ethics, teamwork, communication, project management not directly covered.
Cognitive Alignment	**BTL 2–4 (Understanding → Analyzing)** - Focus on understanding physical principles and analyzing semiconductor and material behavior.

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CS201ES – Programming for Problem Solving

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Mapped Unit
CS201ES.1	**Analyze** computational problems and **formulate** algorithms and flowcharts to develop basic C programs using control structures and operators.	4	Analyzing	Unit I
CS201ES.2	**Implement** programs using arrays and pointers to efficiently manage, access, and manipulate data in memory.	3	Applying	Unit II
CS201ES.3	**Construct** programs using structures, unions, and strings to model real-world entities and manage aggregated data.	3	Applying	Unit III
CS201ES.4	**Design** modular and optimized programs by applying user-defined functions, recursion, and dynamic memory allocation.	5	Evaluating	Unit IV
CS201ES.5	**Develop** integrated data-driven applications by combining file handling operations and preprocessor directives.	6	Creating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	-	1	-	-	-	-	-	-	1	2	1	3	-
CO2	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	-
CO3	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	-
CO4	3	3	3	-	2	-	-	-	-	-	-	2	2	3	3	1
CO5	3	3	3	1	2	-	-	-	-	1	-	2	2	3	3	2
Average	**3**	**3**	**2.2**	**0.2**	**1.8**	**–**	**–**	**–**	**–**	**0.2**	**–**	**1.4**	**2**	**2.2**	**3**	**0.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 & PO2:** The course is foundational, providing core programming knowledge and systematic problem-analysis skills through algorithm design. **PSO-3:** Directly applies mathematical and logical concepts to solve computational problems and model data.
Moderate (2)	**PO3 & PO5:** Students design program structures and use modern programming tools (IDEs, compilers). **PSO-2:** Establishes foundational software development skills and proficiency in the C programming language.
Minor (1)	**PO4 & PO12:** Introduces investigative testing/debugging and provides a base for lifelong learning in programming. **PO10 & PSO-4:** Final project introduces documentation and fosters innovative application development.
No Mapping	**PO6, PO7, PO8, PO9, PO11, PSO-1:** Not covered, as the course focuses on core individual programming skills without addressing societal, environmental, ethical, teamwork, management, or hardware aspects.
Cognitive Range	**BTL 3-6:** Excellent progression from **Applying** syntax → **Analyzing** problems → **Evaluating** design → **Creating** integrated applications, demonstrating high-order skill development.

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ME201ES – Engineering Graphics

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Verb	Linked Unit
ME201ES.1	**Construct** geometric shapes, conic sections, and engineering curves by applying engineering graphics principles and BIS standards.	3	Applying	Unit I
ME201ES.2	**Analyze** spatial relationships and **construct** orthographic projections of points and lines inclined to reference planes.	4	Analyzing	Unit II
ME201ES.3	**Generate** orthographic projections of planes and solids, and **deduce** sectional views with true shapes.	4	Analyzing	Unit III
ME201ES.4	**Develop** surface patterns and **interpret** intersection curves of solids for engineering applications.	6	Creating	Unit IV
ME201ES.5	**Create** isometric projections from orthographic views and **generate** technical drawings using CAD software.	6	Creating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	1	-	-	3	-
CO5	3	3	3	-	3	-	-	-	-	-	-	2	-	-	3	1
Average	**2.8**	**2.8**	**2**	**–**	**0.6**	**–**	**–**	**–**	**–**	**–**	**–**	**0.6**	**–**	**–**	**3**	**0.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Mathematical Concepts):** The entire course is an application of geometric and spatial mathematics to model and represent physical objects, making this the strongest correlation. Students apply mathematical principles to solve spatial problems through projections and developments.
Moderate (2)	**PO1 & PO2:** Provides foundational engineering knowledge of graphics standards and develops strong problem-analysis through spatial visualization and interpretation of engineering drawings. **PO3 (Design):** Develops engineering design thinking through creation of projections, surface developments, and technical drawings that form the basis for manufacturing and construction.
Minor (1)	**PO5 & PO12:** Use of CAD software as a modern engineering tool and learning technical drawing as a fundamental, lifelong engineering skill essential for continuous professional development. **PSO-4:** Basic introduction to technical communication through engineering drawings.
No Mapping	**PO4, PO6, PO7, PO8, PO9, PO10, PO11, PSO-1, PSO-2:** The course focuses exclusively on core visualization, drafting, and CAD skills without addressing research methods, societal impact, environmental concerns, ethics, teamwork, verbal communication, management, computer systems, or software development.
Cognitive Range	**BTL 3-6:** Excellent progression from **Applying** principles → **Analyzing** spatial relationships → **Creating** complex surface developments and CAD drawings, demonstrating development of high-order engineering visualization and design skills.

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MC201ESC – Environmental Science

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
MC201ESC.1	**Explain** the importance of natural resources and **illustrate** methods for their conservation and sustainable utilization.	2	Understanding	Unit I
MC201ESC.2	**Summarize** the structure, function, and significance of ecosystems and **analyze** biodiversity conservation strategies.	4	Analyzing	Unit II
MC201ESC.3	**Identify** sources, causes, and impacts of environmental pollution and **apply** suitable control and management techniques.	3	Applying	Unit III
MC201ESC.4	**Discuss** global environmental issues, climate change, and international efforts toward environmental protection.	2	Understanding	Unit IV
MC201ESC.5	**Evaluate** environmental policies, acts, and sustainable development practices for responsible engineering solutions.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	–	–	–	–	–	2	3	2	–	–	–	1	–	–	–	2
CO2	–	1	1	–	–	3	3	2	–	–	–	1	–	–	–	2
CO3	1	2	2	1	–	3	3	2	–	–	–	1	–	–	–	2
CO4	1	1	–	–	–	3	3	3	–	–	–	1	–	–	–	2
CO5	1	1	1	1	–	3	3	3	–	–	–	2	–	–	–	3
Average	**0.6**	**1**	**0.8**	**0.4**	**–**	**2.8**	**3**	**2.4**	**–**	**–**	**–**	**1.2**	**–**	**–**	**–**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO6 (The Engineer and Society), PO7 (Environment & Sustainability), PO8 (Ethics), PSO4 (Applications of Computing & Research Ability)** — course builds awareness of social responsibility, environmental ethics, and sustainable solutions using technological insights.
Moderate (2)	**PO10 (Communication), PO12 (Lifelong Learning)** — promotes communication of environmental information and continual learning of emerging environmental regulations.
Minor (1)	**PO1–PO4** — students interpret data, apply logical reasoning, and relate scientific principles but not as the course's main focus.
No Mapping	**PO5, PO9, PO11, PSO1–PSO3** — modern tool usage and core IT skills are outside the course scope.
Cognitive Range	**BTL 2 → 5** — progresses from understanding ecosystems to evaluating environmental policies and sustainable engineering practices.

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PH252BS – Applied Physics Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Group / Theme
PH252BS.1	**Demonstrate** experimental setup procedures and **measure** physical parameters such as energy gap, Hall coefficient, and Planck's constant using semiconductor and optical devices.	3	Applying	Quantum mechanics & Semiconductor device experiments (Ex-1 to 5)
PH252BS.2	**Apply** analytical and graphical techniques to **analyze** experimental data for optical, electrical, and magnetic phenomena.	4	Analyzing	Laser, Solar cell, Fiber optics experiments (Ex-5 to 7)
PH252BS.3	**Perform** error analysis, **interpret** results, and **validate** physical laws through experimental observation and comparison with theory.	5	Evaluating	LCR, RC, Stewart-Gee & other verification experiments (Ex-8 to 10)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	2	2	–	–	–	–	1	–	1	3	2	1	–
CO2	3	3	2	2	3	–	–	–	1	2	–	1	3	3	2	–
CO3	3	3	3	3	3	–	–	–	1	2	–	2	3	3	3	–
Average	**3**	**2.67**	**2**	**2.33**	**2.67**	**–**	**–**	**–**	**0.67**	**1.67**	**–**	**1.33**	**3**	**2.67**	**2**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO5 (Modern Tool Usage), PSO1–PSO2** — students apply physics principles using experimental setups and electronic/optical instruments, linking theory to hardware and data acquisition.
Moderate (2)	**PO3 (Design / Development), PO4 (Investigations), PO10 (Communication), PO12 (Lifelong Learning), PSO3** — learners design procedures, record data, communicate results, and develop a habit of experimental validation and continuous learning.
Minor (1)	Basic exposure to teamwork and report documentation during group lab experiments (**PO9**).
No Mapping	**PO6–PO8, PSO4** — no direct content on ethics, societal impact, or research innovation at this level.
Cognitive Range	**BTL 3 → 5** — progression from performing and applying experimental methods to analyzing and evaluating results for validation of physical laws.

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CS251ES: Programming for Problem Solving Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Units
CS251ES.1	**Apply** the fundamentals of C programming constructs such as data types, control structures, and expressions to **develop** simple applications.	3	Applying	Expressions, Control Structures, Decision & Looping Programs
CS251ES.2	**Implement** and **analyze** programs using arrays, pointers, strings, and structures for efficient data handling and modularity.	4	Analyzing	Arrays, Pointers, Strings, and Structures
CS251ES.3	**Design** and **develop** modular programs using functions, dynamic memory allocation, and file handling to **solve real-world problems** effectively.	5	Creating	Functions, DMA, Files, and Integration Projects

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	2	–	–	–	–	1	–	1	3	3	2	–
CO2	3	3	3	2	3	–	–	–	1	2	–	1	3	3	2	–
CO3	3	3	3	2	3	–	–	–	1	2	–	2	3	3	3	–
Average	**3**	**3**	**2.67**	**1.67**	**2.67**	**–**	**–**	**–**	**0.67**	**1.67**	**–**	**1.33**	**3**	**3**	**2.33**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO5 (Modern Tool Usage), PSO1–PSO2** — students design, compile, and test programs using modern compilers and debugging tools, integrating core computational logic.
Moderate (2)	**PO3 (Design/Development), PO4 (Investigations), PO10 (Communication), PO12 (Lifelong Learning), PSO3** — course encourages design thinking, structured problem solving, documenting program output, and continuous skill improvement.
Minor (1)	**PO9 (Team Work)** — students collaborate in pair programming, debugging, and result verification during lab sessions.
No Mapping	**PO6–PO8, PSO4** — no direct content on ethics, sustainability, or research-oriented innovation.
Cognitive Range	**BTL 3 → 5** — progresses from applying programming fundamentals to analyzing and creating modular, real-world solutions.

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MR21 – Revised Course Outcome
B.Tech. III Semester
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MA303BS: Probability Distributions and Numerical Methods

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
MA303BS.1	**Apply** the fundamental concepts of probability and random variables to **analyze** various events and expected values.	3	Applying	Unit I
MA303BS.2	**Examine** discrete and continuous probability distributions (Binomial, Poisson, Normal, Exponential) and **illustrate** their applications.	4	Analyzing	Unit II
MA303BS.3	**Analyze** statistical data and **perform** hypothesis testing using large and small sample tests.	4	Analyzing	Unit III
MA303BS.4	**Solve** algebraic and transcendental equations using numerical methods and **estimate** unknown values using interpolation techniques.	3	Applying	Unit IV
MA303BS.5	**Develop** and **apply** numerical techniques for integration and ordinary differential equations to obtain approximate solutions.	5	Creating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	-	1	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	1	1	2	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	2	2	2	-	-	-	-	-	-	1	-	-	3	1
Average	**3**	**2.8**	**0.6**	**1.2**	**0.8**	**–**	**–**	**–**	**–**	**–**	**–**	**0.2**	**–**	**–**	**3**	**0.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	- **PO1 & PSO-3:** Provides core mathematical knowledge (probability, statistics, numerical analysis) essential for modelling and solving complex engineering problems.
Moderate (2)	- **PO2:** Strongly develops problem analysis through statistical inference and numerical solution formulation. - **PO4:** Introduces investigative methods via hypothesis testing and numerical experimentation.
Minor (1)	- **PO3 & PO5:** Lightly introduces solution design and computational tools through numerical algorithms. - **PO12 & PSO-4:** Builds foundation for continuous learning in data science and computational methods.
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11, PSO-1, PSO-2:** Not covered. The course focuses purely on mathematical methodology without addressing societal, environmental, ethical, teamwork, or system/software aspects.
Cognitive Range	**BTL 3-5:** Strong progression from **Applying** concepts → **Analyzing** distributions/data → **Creating** numerical solutions for complex equations.

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EC331ES: Analog and Digital Electronics

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
EC331ES.1	**Analyze** the characteristics of semiconductor diodes and **evaluate** the performance of diode-based circuits including rectifiers and wave-shaping circuits.	4	Analyzing	Unit I
EC331ES.2	**Design** and **analyze** biasing circuits for Bipolar Junction Transistors (BJTs) and **evaluate** the performance of single-stage BJT amplifiers.	5	Evaluating	Unit II
EC331ES.3	**Compare** the operating principles of different Field Effect Transistors (FETs) and **analyze** the characteristics of various digital logic families.	4	Analyzing	Unit III
EC331ES.4	**Design** optimized combinational logic circuits using Boolean algebra and K-map simplification techniques for specified functional requirements.	6	Creating	Unit IV
EC331ES.5	**Construct** and **analyze** the operation of sequential logic circuits including flip-flops, counters, and shift registers for digital systems.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	-	-	-	-	-	-	-	1	3	-	3	-
CO2	3	3	2	1	-	-	-	-	-	-	-	1	3	-	3	-
CO3	3	3	2	1	-	-	-	-	-	-	-	1	3	-	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2	2	1	3	2
CO5	3	3	3	2	-	-	-	-	-	-	-	2	2	1	3	2
Average	**3**	**3**	**2.2**	**1.4**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**1.4**	**2.6**	**0.4**	**3**	**0.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	- **PO1 & PO2:** Core foundation in analyzing electronic devices and solving circuit design problems - **PSO-1 & PSO-3:** Direct hardware system understanding and mathematical modeling of electronic circuits
Moderate (2)	- **PO3:** Strong design focus in combinational/sequential logic circuits - **PO4:** Experimental analysis of circuit characteristics and performance
Minor (1)	- **PO12:** Foundation for lifelong learning in evolving electronics technology - **PSO-2 & PSO-4:** Basic software-hardware interface understanding and innovative circuit design
No Mapping	**PO5, PO6, PO7, PO8, PO9, PO10, PO11:** Not covered - focuses on core electronics without tools, society, environment, ethics, teamwork, communication, or management aspects
Cognitive Range	**BTL 4-6:** Advanced progression from **Analyzing → Evaluating → Creating** electronic systems

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CS301PC: Data Structures

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
CS301PC.1	**Implement** operations on stacks and queues using arrays and **analyze** their applications in solving computational problems like expression evaluation and scheduling.	4	Analyzing	Unit I
CS301PC.2	**Design** and **implement** various linked list operations (singly, doubly, circular) and **evaluate** their memory efficiency for dynamic data management.	5	Evaluating	Unit II
CS301PC.3	**Construct** binary search trees and **analyze** traversal algorithms for efficient data organization and retrieval.	4	Analyzing	Unit III
CS301PC.4	**Apply** graph representation methods and traversal algorithms (BFS, DFS) to solve pathfinding and connectivity problems in real-world networks.	3	Applying	Unit IV
CS301PC.5	**Design** hash functions using different collision resolution techniques and **evaluate** their performance for efficient data storage and retrieval systems.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	-
CO2	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	-
CO3	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	1
CO4	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	1
CO5	3	3	3	-	2	-	-	-	-	-	-	2	2	2	3	2
Average	**3**	**3**	**2.2**	**–**	**2**	**–**	**–**	**–**	**–**	**–**	**–**	**1.2**	**2**	**2**	**3**	**0.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	- **PO1 & PO2:** Core engineering knowledge in data organization and strong problem analysis through algorithm selection - **PSO-3:** Direct application of mathematical concepts in algorithm complexity and data structure design
Moderate (2)	- **PO3 & PO5:** Significant design of efficient data structures and use of programming tools/IDEs - **PSO-1 & PSO-2:** Hardware memory management understanding and software development foundations
Minor (1)	- **PO12:** Foundation for continuous learning in advanced algorithms and data structures - **PSO-4:** Innovative problem-solving through optimized data structure design
No Mapping	**PO4, PO6, PO7, PO8, PO9, PO10, PO11:** Not covered - focuses on algorithmic efficiency without research methods, societal impact, environment, ethics, teamwork, communication, or management
Cognitive Range	**BTL 3-5:** Excellent progression from **Applying → Analyzing → Evaluating** data structures and algorithms

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IT301PC: Computer Organization and Microprocessor

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
IT301PC.1	**Explain** the basic organization, components, and functions of a computer system and **illustrate** instruction cycle and control unit design.	2	Understanding	Unit I
IT301PC.2	**Analyze** the internal architecture and operations of the 8086 microprocessor and **interpret** instruction formats and addressing modes.	4	Analyzing	Unit II
IT301PC.3	**Develop** assembly language programs using the 8086 - instruction set for solving computational problems.	3	Applying	Unit III
IT301PC.4	**Explain** and **compare** various computer arithmetic algorithms and **illustrate** I/O organization and interrupt handling techniques.	3	Applying	Unit IV
IT301PC.5	**Demonstrate** memory organization, cache, and pipelining techniques to **evaluate** processor performance and parallel execution.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	1	3	-	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	1	3	-	3	-
CO3	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	-
CO4	3	2	1	-	-	-	-	-	-	-	-	1	2	-	3	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2	3	-	3	1
Average	**3**	**2.6**	**1.6**	**–**	**0.4**	**–**	**–**	**–**	**–**	**–**	**–**	**1.2**	**2.6**	**0.4**	**2.8**	**0.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	- **PO1:** Core knowledge of computer architecture and microprocessor systems - **PSO-1 & PSO-3:** Direct understanding of computer system principles and mathematical modelling of computer arithmetic
Moderate (2)	- **PO2 & PO3:** Strong problem analysis of microprocessor operations and basic design of assembly programs - **PSO-2:** Foundation for software-hardware interface understanding
Minor (1)	- **PO5 & PO12:** Basic assembly programming tools and foundation for continuous learning in computer architecture - **PSO-4:** Performance evaluation of processor systems
No Mapping	**PO4, PO6, PO7, PO8, PO9, PO10, PO11:** Not covered - focuses on hardware architecture without research methods, societal impact, environment, ethics, teamwork, communication, or management
Cognitive Range	**BTL 2-5:** Good progression from **Understanding → Applying → Analyzing → Evaluating** computer systems

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IT302PC – C++ Programming

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit
IT302PC.1	**Explain** the principles of Object-Oriented Programming (OOP) and **apply** them using C++ constructs such as classes, objects, and functions.	3	Applying	Unit I
IT302PC.2	**Demonstrate** the concepts of data abstraction and encapsulation by **implementing** classes, constructors, destructors, and static members.	3	Applying	Unit II
IT302PC.3	**Develop** programs using inheritance, polymorphism, and virtual functions to **achieve** code reusability and dynamic behavior.	4	Analyzing	Unit III
IT302PC.4	**Apply** file handling and operator overloading mechanisms for **managing** data and enhancing program capabilities.	4	Applying	Unit IV
IT302PC.5	**Design** and **implement** reusable and robust applications using templates and exception handling in C++.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	2	-	-	-	-	-	-	1	2	3	2	-
CO2	3	2	2	-	2	-	-	-	-	-	-	1	2	3	2	-
CO3	3	3	3	-	2	-	-	-	-	-	-	1	2	3	3	1
CO4	3	2	2	-	2	-	-	-	-	-	-	1	2	3	2	1
CO5	3	3	3	-	2	-	-	-	-	-	-	2	2	3	3	2
Average	**3**	**2.4**	**2.2**	**–**	**2**	**–**	**–**	**–**	**–**	**–**	**–**	**1.2**	**2**	**3**	**2.4**	**0.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	- **PO1:** Core engineering knowledge of OOP principles and C++ programming - **PSO-2:** Strong foundation in software development using object-oriented programming
Moderate (2)	- **PO2 & PO3:** Problem analysis through OOP design and development of object-oriented solutions - **PO5:** Use of C++ compilers and development environments - **PSO-3:** Application of OOP concepts to model real-world problems
Minor (1)	- **PO12:** Foundation for continuous learning in advanced programming and software engineering - **PSO-4:** Innovative application development using advanced C++ features
No Mapping	**PO4, PO6, PO7, PO8, PO9, PO10, PO11, PSO-1:** Not covered - focuses on programming concepts without hardware, research, societal, environmental, ethical, teamwork, communication, or management aspects
Cognitive Range	**BTL 3-5:** Good progression from **Applying → Analyzing → Evaluating** object-oriented programs

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EC361ES: Analog and Digital Electronics Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Themes
EC361ES.1	**Construct** and **test** semiconductor device circuits (Diodes, BJTs, FETs) to **analyze** their characteristics and **verify** rectifier/amplifier functionality.	4	Analyzing	Diode & BJT/FET characteristics, rectifiers (Ex 1–6)
EC361ES.2	**Implement** small-signal amplifier circuits from given specifications and **evaluate** performance by comparing theoretical and experimental results.	5	Evaluating	Amplifier design and frequency response (Ex 3–6)
EC361ES.3	**Develop** and **troubleshoot** combinational and sequential logic circuits to **validate** their operation against Boolean expressions and system requirements.	5	Evaluating	Logic gates, combinational & sequential circuits (Ex 7–12)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	-	-	1	1	-	-	1	3	-	3	-
CO2	3	3	2	3	2	-	-	1	1	-	-	1	3	-	3	1
CO3	3	3	2	2	2	-	-	1	1	-	-	1	2	1	3	2
Average	**3**	**3**	**2**	**2.33**	**2**	**–**	**–**	**1**	**1**	**–**	**–**	**1**	**2.67**	**0.33**	**3**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 & PO2:** Core knowledge of electronic devices and circuits with strong problem-analysis through circuit testing and troubleshooting. **PSO-1 & PSO-3:** Direct hardware system understanding and mathematical modeling of circuit behavior through experimental verification.
Moderate (2)	**PO3 & PO4:** Circuit implementation skills and investigative approach through experimental analysis and result validation. **PO5:** Use of electronic test equipment (oscilloscopes, multimeters, signal generators) as modern engineering tools.
Minor (1)	**PO8 & PO9:** Laboratory safety practices and collaborative work in circuit implementation and testing. **PO12:** Foundation for continuous practical learning in electronics and circuit design. **PSO-2 & PSO-4:** Basic hardware-software interface understanding and innovative problem-solving through circuit troubleshooting.
No Mapping	**PO6, PO7, PO10, PO11:** Lab focuses on technical skills without addressing societal impact, environmental concerns, communication, or project management aspects.
Cognitive Range	**BTL 4-5:** Strong practical progression from **Analyzing** circuit characteristics → **Evaluating** amplifier performance → **Evaluating** digital system functionality through troubleshooting.

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CS351PC: Data Structures Lab

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Units
CS351PC.1	**Implement** programs using arrays, structures, and pointers to **apply** the fundamentals of linear data structures like stacks and queues.	3	Applying	Arrays, Stacks, Queues, Linked Lists (Ex-1 to 5)
CS351PC.2	**Analyze** and **develop** programs for non-linear data structures such as trees and graphs to support efficient data manipulation.	4	Analyzing	Trees & Graphs (Ex-6 to 8)
CS351PC.3	**Design, test**, and **evaluate** sorting, searching, and hashing algorithms to **solve** real-world computational problems.	5	Evaluating	Searching, Sorting, Hashing (Ex-9 to 12)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	2	-	-	-	-	-	-	1	2	2	3	-
CO2	3	3	2	-	2	-	-	-	-	-	-	1	2	2	3	1
CO3	3	3	3	-	2	-	-	-	-	-	-	2	2	2	3	2
Average	**3**	**2.67**	**2**	**–**	**2**	**–**	**–**	**–**	**–**	**–**	**–**	**1.33**	**2**	**2**	**3**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge):** Core implementation of data structures and algorithms. **PSO-3 (Mathematical Concepts):** Direct application of algorithmic thinking and complexity analysis.
Moderate (2)	**PO2 & PO3:** Strong problem analysis through algorithm selection and design of efficient solutions. **PO5:** Use of programming tools, compilers, and debuggers. **PSO-2:** Foundation in software development methodologies.
Minor (1)	**PO12:** Foundation for continuous learning in advanced algorithms. **PSO-4:** Innovative problem-solving through optimized algorithm design.
No Mapping	**PO4, PO6, PO7, PO8, PO9, PO10, PO11, PSO-1:** Not covered - focuses on programming implementation without research methods, societal impact, environment, ethics, teamwork, communication, management, or hardware aspects.
Cognitive Range	**BTL 3-5:** Strong practical progression from **Applying → Analyzing → Evaluating** data structures and algorithms.

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IT351PC: IT Workshop and Microprocessor Lab

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Group
IT351PC.1	**Apply** basic computer hardware and software installation procedures and **demonstrate** troubleshooting skills using OS and peripheral utilities.	3	Applying	IT Workshop – Hardware setup, OS installation, peripheral configuration
IT351PC.2	**Develop** productivity documents, spreadsheets, and presentations to **demonstrate** effective use of office and internet tools for academic and professional applications.	4	Analyzing	IT Workshop – MS Office / LibreOffice, Google tools, Internet utilities
IT351PC.3	**Implement** assembly language programs using 8086 instruction set to **solve** arithmetic, logical, and control problems.	3	Applying	Microprocessor Lab – Basic programs (Ex-1 to Ex-5)
IT351PC.4	**Design** and **test** interfacing experiments (ADC/DAC, stepper motor, display modules) to **demonstrate** integration of hardware and software.	5	Evaluating	Microprocessor Lab – Interfacing and advanced applications (Ex-6 to Ex-10)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	3	-	-	1	1	-	-	1	3	1	1	-
CO2	1	1	1	-	2	-	-	1	1	2	-	1	1	2	1	1
CO3	3	3	2	1	2	-	-	1	1	-	-	1	3	2	3	1
CO4	3	3	3	2	2	-	-	1	1	-	-	1	3	2	3	2
Average	**2.3**	**2.3**	**1.8**	**1.0**	**2.3**	**-**	**-**	**1.0**	**1.0**	**0.5**	**-**	**1.0**	**2.5**	**1.8**	**2.0**	**1.0**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-1 (Foundation of Computer System):** Strong mapping through hardware/software installation (CO1) and microprocessor interfacing (CO3, CO4). **PO1 & PO2:** Core IT knowledge and problem-solving through hardware troubleshooting and assembly programming.
Moderate (2)	**PO5 (Modern Tool Usage):** Application of OS tools, office suites, and microprocessor development tools. **PSO-2 & PSO-3:** Software tool proficiency and logical problem-solving through assembly programming. **PO3 (Design):** Hardware-software interface design in microprocessor applications.
Minor (1)	**PO4, PO8, PO9, PO10, PO12:** Basic investigations, safety practices, teamwork, documentation, and lifelong learning in IT skills. **PSO-4:** Innovative applications in hardware-software integration projects.
No Mapping	**PO6, PO7, PO11:** No focus on societal impact, environmental sustainability, or project management.
Cognitive Range	**BTL 3-5:** Practical progression from **Applying** IT skills → **Analyzing** productivity tools → **Applying** assembly programming → **Evaluating** hardware-software integration.

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IT352PC: C++ Programming Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Themes
IT352PC.1	**Apply** fundamental concepts of Object-Oriented Programming such as classes, objects, functions, and constructors to **develop** modular C++ programs.	3	Applying	Basic OOP Concepts, Classes & Objects, Constructors/Destructors
IT352PC.2	**Implement** operator overloading, inheritance, and polymorphism to **analyze** reusable and extensible software components.	4	Analyzing	Overloading, Inheritance, Virtual Functions
IT352PC.3	**Design** and **develop** C++ programs using templates, exception handling, and file handling to **solve** real-world problems effectively.	5	Evaluating	Templates, Exceptions, File Handling, Mini Projects

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3	–	–	–	1	1	–	1	3	3	2	–
CO2	3	3	3	2	3	–	–	–	1	2	–	1	3	3	3	–
CO3	3	3	3	3	3	–	–	–	1	2	–	2	3	3	3	–
Average	**3**	**3**	**2.67**	**2.33**	**3**	**–**	**–**	**–**	**1**	**1.67**	**–**	**1.33**	**3**	**3**	**2.67**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO5 (Modern Tool Usage), PSO1–PSO2–PSO3** — course builds core C++ programming expertise through IDE-based coding, debugging, and implementation of OOP principles in structured projects.
Moderate (2)	**PO3 (Design/Development), PO4 (Investigations), PO10 (Communication), PO12 (Lifelong Learning)** — students design, test, and document modular code, exploring continuous enhancement through new C++ features and problem-solving approaches.
Minor (1)	**PO9 (Team Work)** — teamwork is developed during mini-projects, collaborative code reviews, and output verification.
No Mapping	**PO6–PO8, PSO4** — course does not include societal, ethical, or research innovation aspects.
Cognitive Range	**BTL 3 → 5** — students progress from implementing OOP fundamentals to creating reusable, file-driven, and exception-safe programs.

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EN351HS: Finishing School-I

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
EN351HS.1	**Apply** principles of effective communication and body language to **demonstrate** professional oral and written communication.	3	Applying	Unit I – Communication Skills
EN351HS.2	**Illustrate** techniques of self-awareness, goal setting, and time management to **develop** personal effectiveness.	3	Applying	Unit II – Self-Management Skills
EN351HS.3	**Analyze** leadership qualities, teamwork strategies, and conflict management techniques for organizational collaboration.	4	Analyzing	Unit III – Teamwork & Leadership
EN351HS.4	**Demonstrate** interpersonal effectiveness through **roleplays, problem-solving, and decision-making** exercises.	4	Analyzing	Unit IV – Interpersonal & Problem-Solving Skills
EN351HS.5	**Exhibit** ethical behavior, professional etiquette, and a positive attitude essential for career readiness.	5	Evaluating	Unit V – Professional Ethics & Attitude Building

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-	-
CO2	-	-	-	-	-	-	-	1	2	1	-	2	-	-	-	-
CO3	-	-	-	-	-	1	-	1	3	2	-	1	-	-	-	-
CO4	-	1	-	-	-	1	-	1	2	2	-	1	-	-	-	-
CO5	-	-	-	-	-	1	-	3	2	1	-	2	-	-	-	-
Average	**–**	**0.2**	**–**	**–**	**–**	**0.6**	**–**	**1.2**	**2**	**1.8**	**–**	**1.4**	**–**	**–**	**–**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10 (Communication)** – Core focus on professional oral and written communication skills.
Moderate (2)	**PO9 (Individual and Team Work)** – Teamwork strategies, collaboration, and interpersonal effectiveness. **PO12 (Life-long Learning)** – Self-awareness, goal setting, and continuous personal development. **PO8 (Ethics)** – Ethical behavior and professional etiquette.
Minor (1)	**PO2 (Problem Analysis)** – Problem-solving and decision-making exercises. **PO6 (The Engineer and Society)** – Professional conduct and societal interaction.
No Mapping	**PO1, PO3, PO4, PO5, PO7, PO11, PSO1, PSO2, PSO3, PSO4** – Technical engineering knowledge, design, investigations, tools, environmental aspects, management, and IT-specific outcomes not covered.
Cognitive Range	**BTL 3-5 (Applying → Evaluating)** – Strong emphasis on applying communication skills, analyzing interpersonal dynamics, and evaluating professional behavior.

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MR21 – Revised Course Outcome
B.Tech. III Semester

Regulation: MR21 **Year/Sem: II /I** **Department: IT**

MC351HS: Gender Sensitization Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC351HS.1	**Identify** gender-based stereotypes and **explain** the need for gender equality in personal and professional contexts.	2	Understanding	Unit I – Introduction to Gender Studies
MC351HS.2	**Discuss** the social, cultural, and economic factors influencing gender roles and **interpret** issues of discrimination and empowerment.	3	Applying	Unit II – Social Construction of Gender
MC351HS.3	**Analyze** case studies related to gender-based violence and **suggest** preventive and responsive measures.	4	Analyzing	Unit III – Gender and Violence
MC351HS.4	**Examine** laws, policies, and institutional frameworks promoting gender justice and **evaluate** their impact.	5	Evaluating	Unit IV – Legal and Institutional Mechanisms
MC351HS.5	**Demonstrate** gender sensitivity, ethical behavior, and inclusive mindset through reflective and experiential learning activities.	5	Evaluating	Unit V – Gender Sensitization Practices & Reflection

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	2	1	2	2	-	-	1	-	-	-	-
CO2	-	-	-	-	-	3	2	2	2	-	-	1	-	-	-	-
CO3	-	-	-	-	-	3	1	3	1	-	-	1	-	-	-	-
CO4	-	-	-	-	-	2	-	3	-	-	-	1	-	-	-	-
CO5	-	-	-	-	-	2	1	3	3	1	-	2	-	-	-	-
Average	–	–	–	–	–	2.4	1	2.6	1.6	0.2	–	1.2	–	–	–	–

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO6 (Engineer and Society)** – Addresses societal, health, safety, and cultural issues related to gender. **PO8 (Ethics)** – Focuses on ethical principles and professional conduct regarding gender equality. **PO9 (Individual and Team Work)** – Promotes inclusive behavior and effective collaboration in diverse settings.
Moderate (2)	**PO7 (Environment & Sustainability)** – Connects gender issues to sustainable and inclusive societal development. **PO12 (Life-long Learning)** – Encourages continuous learning about evolving social and gender norms.
Minor (1)	**PO10 (Communication)** – Indirectly enhances sensitive and respectful communication skills.
No Mapping	**PO1-PO5, PO11, PSO1-PSO4** – These technical and engineering-specific outcomes are not covered in this social science-oriented course.
Cognitive Range	**BTL 2-5 (Understanding → Evaluating)** – Ranges from understanding basic concepts to analyzing case studies and evaluating policies.

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MR21 – Revised Course Outcome

B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

MS401HS: Business Economics and Financial Analysis

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MS401HS.1	**Analyze** different forms of business entities and **evaluate** the impact of economic variables and business cycles on organizational strategy.	4	**Analyzing**	Unit I
MS401HS.2	**Apply** demand and supply analysis to **forecast** market behavior and **evaluate** price elasticity for business decision-making.	3	**Applying**	Unit II
MS401HS.3	**Evaluate** production functions, cost structures, and market dynamics to **formulate** optimal pricing and competitive strategies.	5	**Evaluating**	Unit III
MS401HS.4	**Prepare** financial statements by **applying** accounting principles and double-entry bookkeeping to represent business performance accurately.	3	**Applying**	Unit IV
MS401HS.5	**Analyze** financial statements using ratio analysis to **assess** organizational liquidity, profitability, and financial stability.	4	**Analyzing**	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	-	2	1	1	-	1	-	2	-	-	1	1
CO2	2	3	2	-	-	1	-	-	-	1	-	1	-	-	2	1
CO3	2	3	2	-	-	1	-	1	-	2	-	1	-	-	2	1
CO4	1	1	1	-	-	-	-	2	1	1	-	1	-	-	1	-
CO5	2	3	2	-	-	1	1	2	1	2	-	2	-	-	2	1
Average	**1.8**	**2.4**	**1.6**	**–**	**–**	**1.0**	**0.4**	**1.2**	**0.4**	**1.4**	**–**	**1.4**	**–**	**–**	**1.6**	**0.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis)** - Strongly addressed through economic analysis, demand forecasting, and financial ratio interpretation.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design/Development), PO12 (Life-long Learning), PSO-3 (Mathematical Modeling)** - Provides foundational knowledge in economics and financial analysis applicable to engineering project management and business decisions.
Minor (1)	**PO6 (Society), PO8 (Ethics), PO9 (Teamwork), PO10 (Communication)** - Business ethics, societal impact of economic decisions, and communication of financial information are partially addressed.
No Mapping	**PO4, PO5, PO7, PO11, PSO-1, PSO-2, PSO-4** - Investigation, modern tools, environment, project management, core CS concepts, software development, and research are not directly related to business economics.
Cognitive Range	**BTL 3–5 (Applying → Evaluating)** - Strong emphasis on applying economic principles, analyzing financial data, and evaluating business strategies.

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MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

CS401PC: Operating Systems

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS401PC.1	**Explain** operating system objectives, architecture, services, and system call interfaces for different computing environments.	2	Understanding	Unit I – Introduction & System Structures
CS401PC.2	**Analyze** process management, CPU scheduling algorithms, and interprocess communication mechanisms for system performance evaluation.	4	Analyzing	Unit II – Process Management & CPU Scheduling
CS401PC.3	**Apply** synchronization techniques, deadlock handling methods, and process coordination mechanisms to solve concurrent processing problems.	3	Applying	Unit III – Process Synchronization & Deadlocks
CS401PC.4	**Evaluate** memory management schemes including paging, segmentation, and virtual memory with page replacement algorithms for optimal resource utilization.	5	Evaluating	Unit IV – Memory Management
CS401PC.5	**Implement** file system operations, storage allocation methods, and disk management techniques for efficient data organization and access.	3	Applying	Unit V – File Systems & Storage Management

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	1	1	-
CO2	3	3	2	1	-	-	-	-	-	-	-	1	2	2	2	-
CO3	3	3	2	1	-	-	-	-	-	-	-	1	2	2	2	-
CO4	3	3	2	2	1	-	-	-	-	-	-	1	2	2	2	-
CO5	3	3	2	2	1	-	-	-	-	-	-	1	2	2	2	-
Average	**3.0**	**2.8**	**1.8**	**1.2**	**0.4**	**–**	**–**	**–**	**–**	**–**	**–**	**1.0**	**2.0**	**1.8**	**1.8**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge)** – Core operating system concepts form fundamental computer science and engineering knowledge essential for IT professionals.
Moderate (2)	**PO2 (Problem Analysis)** – Analyzing process scheduling, synchronization, and memory management problems. **PO3 (Design/Development)** – Designing solutions for resource management and system optimization. **PSO1 (Computer Systems)** – Direct understanding of computer system organization and management.
Minor (1)	**PO4 (Investigations)** – Basic investigation of OS performance issues. **PO5 (Modern Tools)** – Using operating system utilities and monitoring tools. **PO12 (Life-long Learning)** – Foundation for continuous learning in system software. **PSO3 (Mathematical Concepts)** – Basic application of algorithms in scheduling and memory management.
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11, PSO2, PSO4** – Societal, environmental, ethical, teamwork, communication, project management, software development, and research outcomes not directly covered.
Cognitive Range	**BTL 2-5 (Understanding → Evaluating)** – Comprehensive progression from basic OS concepts to evaluation of system performance and optimization techniques.

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MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

CS403PC: Database Management Systems

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS403PC.1	**Explain** database system concepts, architecture, data models, and design databases using ER modeling techniques.	2	Understanding	Unit I – Introduction & Data Models
CS403PC.2	**Apply** relational algebra, calculus operations, and SQL queries to retrieve and manipulate data from relational databases.	3	Applying	Unit II – Relational Algebra & SQL
CS403PC.3	**Analyze** functional dependencies and apply normalization techniques to design efficient, redundancy-free database schemas.	4	Analyzing	Unit III – Functional Dependencies & Normalization
CS403PC.4	**Evaluate** transaction processing, concurrency control protocols, and recovery mechanisms to ensure database consistency and reliability.	5	Evaluating	Unit IV – Transaction Management & Recovery
CS403PC.5	**Design** storage structures and indexing techniques using hashing and tree-based methods for optimized database performance.	3	Applying	Unit V – Storage & Indexing

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	-	-	-	-	-	-	-	1	2	1	2	-
CO2	3	3	2	1	1	-	-	-	-	-	-	1	2	3	2	-
CO3	3	3	3	2	1	-	-	-	-	-	-	1	2	2	3	-
CO4	3	3	2	2	1	-	-	-	-	-	-	1	2	2	2	-
CO5	3	3	2	2	1	-	-	-	-	-	-	1	2	2	2	-
Average	**3.0**	**2.8**	**2.2**	**1.4**	**0.8**	**–**	**–**	**–**	**–**	**–**	**–**	**1.0**	**2.0**	**2.0**	**2.2**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge)** – Database principles and relational theory form fundamental IT engineering knowledge. **PSO2 (Software Development)** – Essential for developing database-driven software applications.
Moderate (2)	**PO2 (Problem Analysis)** – Analyzing data requirements and database design problems. **PO3 (Design/Development)** – Designing normalized database schemas and efficient structures. **PSO3 (Mathematical Concepts)** – Applying relational algebra and normalization theory.
Minor (1)	**PO4 (Investigations)** – Investigating query performance and optimization techniques. **PO5 (Modern Tools)** – Using DBMS software and database management tools. **PO12 (Life-long Learning)** – Foundation for continuous learning in database technologies. **PSO1 (Computer Systems)** – Basic understanding of data storage and retrieval systems.
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11, PSO4** – Societal, environmental, ethical, teamwork, communication, project management, and research outcomes not directly covered.
Cognitive Range	**BTL 2-5 (Understanding → Evaluating)** – Comprehensive progression from basic database concepts to evaluation of storage structures and performance optimization.

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MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

CS405PC: Java Programming

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS405PC.1	**Apply** object-oriented programming principles using Java classes, objects, inheritance, and polymorphism to solve computational problems.	3	Applying	Unit I – OOP Principles & Java Basics
CS405PC.2	**Implement** packages, interfaces, and exception handling mechanisms to develop modular and robust Java applications.	3	Applying	Unit II – Packages, Interfaces & Exception Handling
CS405PC.3	**Develop** multithreaded applications and stream-based I/O operations to handle concurrent processing and file management.	3	Applying	Unit III – Multithreading & I/O Operations
CS405PC.4	**Utilize** Java collections framework and utility classes to efficiently organize, manipulate, and process data structures.	3	Applying	Unit IV – Collections Framework & Utilities
CS405PC.5	**Design** interactive applications using applets, Swing components, and event handling for graphical user interface development.	3	Applying	Unit V – GUI Programming & Applets

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-	1	-	-	-	-	-	-	1	1	2	1	-
CO2	3	3	2	1	1	-	-	-	-	-	-	1	1	3	2	-
CO3	3	3	2	1	1	-	-	-	-	-	-	1	1	3	2	-
CO4	3	3	2	1	1	-	-	-	-	-	-	1	1	3	2	-
CO5	3	3	3	2	2	-	-	-	-	-	-	1	1	3	2	-
Average	**3.0**	**2.8**	**2.2**	**1.0**	**1.2**	**–**	**–**	**–**	**–**	**–**	**–**	**1.0**	**1.0**	**2.8**	**1.8**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge)** – Object-oriented programming principles form core computer engineering knowledge. **PSO2 (Software Development)** – Directly develops software development skills using Java programming language.
Moderate (2)	**PO2 (Problem Analysis)** – Analyzing problems to develop Java programming solutions. **PO3 (Design/Development)** – Designing object-oriented Java applications with proper architecture. **PSO3 (Mathematical Concepts)** – Applying logical structures and algorithms in programming solutions.
Minor (1)	**PO4 (Investigations)** – Investigating programming solutions and debugging techniques. **PO5 (Modern Tools)** – Using Java development environments and programming tools. **PO12 (Life-long Learning)** – Foundation for continuous learning in programming languages. **PSO1 (Computer Systems)** – Basic understanding of program execution and memory management.
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11, PSO4** – Societal, environmental, ethical, teamwork, communication, project management, and research outcomes not directly covered.
Cognitive Range	**BTL 3-3 (Applying)** – Consistent focus on application of Java programming concepts to solve computational problems across all units.

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MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

CS408PC: Discrete Mathematics

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS408PC.1	**Apply** propositional and predicate logic to **formulate** logical inferences and **construct** mathematical proofs using various proof techniques.	3	Applying	Unit I
CS408PC.2	**Analyze** sets, functions, sequences, and relations to **solve** problems involving discrete structures and their properties.	4	Analyzing	Unit II
CS408PC.3	**Apply** mathematical induction and recursion to **solve** counting problems using permutations, combinations, and combinatorial principles.	3	Applying	Unit III
CS408PC.4	**Analyze** discrete probability concepts and recurrence relations to **solve** advanced counting problems using generating functions.	4	Analyzing	Unit IV
CS408PC.5	**Apply** graph theory concepts including connectivity, paths, trees, and coloring to **solve** computing problems and model real-world scenarios.	3	Applying	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	1	1	1	3	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	1	3	-
CO3	3	3	2	1	-	-	-	-	-	-	-	1	1	2	3	-
CO4	3	3	2	1	-	-	-	-	-	-	-	1	1	2	3	-
CO5	3	3	2	1	-	-	-	-	-	-	-	1	1	3	3	-
Average	**3**	**2.6**	**1.6**	**0.6**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**1**	**1**	**1.8**	**3**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge)** – Forms mathematical foundation for engineering. **PSO3 (Mathematical Concepts)** – Directly applies mathematical methodologies to computation.
Moderate (2)	**PO2 (Problem Analysis)** – Analyzing and solving discrete mathematical problems. **PO3 (Design/Development)** – Designing mathematical models for computational systems.
Minor (1)	**PO4 (Investigations)** – Basic investigation of mathematical properties. **PO12 (Life-long Learning)** – Foundation for continuous mathematical learning. **PSO1 (Computer Systems)** – Basic understanding of mathematical foundations. **PSO2 (Software Development)** – Mathematical basis for algorithm development.
No Mapping	**PO5, PO6, PO7, PO8, PO9, PO10, PO11, PSO4** – Tools, societal, ethical, teamwork, communication, management, and research outcomes not covered.
Cognitive Range	**BTL 3-5 (Applying → Evaluating)** – Strong emphasis on applying concepts, analyzing structures, and evaluating mathematical solutions.

MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

MC401HS: Constitution of India

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC401HS.1	**Analyze** the historical evolution, salient features, and fundamental principles of the Indian Constitution and its significance in governance.	4	Analyzing	Unit I – Introduction & Historical Background
MC401HS.2	**Evaluate** fundamental rights, duties, and directive principles of state policy to understand citizen-state relationships in democratic governance.	5	Evaluating	Unit II – Fundamental Rights & Duties
MC401HS.3	**Compare** the federal structure, parliamentary system, and distribution of powers between union and state governments in India.	4	Analyzing	Unit III – Government Structure & Powers
MC401HS.4	**Examine** constitutional amendment procedures, emergency provisions, and their implications for democratic functioning and crisis management.	4	Analyzing	Unit IV – Constitutional Amendments & Emergencies
MC401HS.5	**Assess** the role of local self-governments and constitutional bodies in strengthening democratic decentralization and governance.	5	Evaluating	Unit V – Local Governance & Constitutional Bodies

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03	PS04
CO1	-	-	-	-	-	2	1	1	-	-	-	1	-	-	-	-
CO2	-	-	-	-	-	3	1	2	-	-	-	1	-	-	-	-
CO3	-	-	-	-	-	3	1	1	-	-	-	1	-	-	-	-
CO4	-	-	-	-	-	2	1	2	-	-	-	1	-	-	-	-
CO5	-	-	-	-	-	3	2	2	1	1	-	2	-	-	-	-
Average	–	–	–	–	–	2.6	1.2	1.6	1.0	1.0	–	1.2	–	–	–	–

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO6 (The Engineer and Society)** – Directly addresses constitutional governance, citizen rights, and societal responsibilities in engineering contexts.
Moderate (2)	**PO8 (Ethics)** – Covers constitutional values, fundamental duties, and professional ethics relevant to engineering practice.
Minor (1)	**PO7 (Environment & Sustainability)** – Indirect connection through directive principles of state policy. **PO9 (Individual & Team Work)** – Basic understanding of collaborative citizenship and democratic participation. **PO10 (Communication)** – Limited to constitutional awareness and civic communication. **PO12 (Life-long Learning)** – Framework for continuous civic learning and constitutional awareness.
No Mapping	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3, PSO4** – Technical engineering knowledge, problem-solving, design, tools, management, and IT-specific outcomes not addressed.
Cognitive Range	**BTL 4-5 (Analyzing → Evaluating)** – Enhanced progression focusing on analysis and evaluation of constitutional principles in engineering and societal contexts.

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MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

CS451PC: Operating Systems Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Experiment Groups / Themes
CS451PC.1	**Apply** basic Linux/UNIX commands and shell programming concepts to **demonstrate** process management and file operations.	3	Applying	Linux basics & Shell scripts (Ex 1 – 4)
CS451PC.2	**Implement** process scheduling, synchronization, and inter-process communication algorithms using C / Java / Python.	4	Analyzing	CPU Scheduling & IPC (Ex 5 – 8)
CS451PC.3	**Develop** programs for memory, file, and device management to **evaluate** system performance and resource utilization.	5	Evaluating	Memory & File Management (Ex 9 – 12)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	3	-	-	-	-	-	-	1	3	2	1	-
CO2	3	3	2	1	3	-	-	-	-	-	-	1	3	3	2	-
CO3	3	3	2	2	3	-	-	-	-	-	-	1	3	3	2	-
Average	**2.67**	**2.67**	**1.67**	**1**	**3**	**–**	**–**	**–**	**–**	**–**	**–**	**1**	**3**	**2.67**	**1.67**	**–**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5 (Modern Tool Usage)** – Extensive use of Linux/UNIX OS, shell scripting, and programming tools. **PSO1 (Computer Systems)** – Direct hands-on experience with OS components and system programming. **PSO2 (Software Development)** – Implements core OS algorithms and system software.
Moderate (2)	**PO1 (Engineering Knowledge)** – Applies core OS concepts in practical implementations. **PO2 (Problem Analysis)** – Analyzes and solves OS-related problems through programming. **PO3 (Design/Development)** – Designs solutions for process scheduling, synchronization, and memory management.
Minor (1)	**PO4 (Investigations)** – Investigates system performance through practical experiments. **PO12 (Life-long Learning)** – Builds foundation for continuous learning in systems programming. **PSO3 (Mathematical Concepts)** – Applies algorithms and performance evaluation methods.
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11, PSO4** – Societal, ethical, teamwork, communication, management, and research outcomes not covered in lab context.
Cognitive Range	**BTL 3-5 (Applying → Evaluating)** – Strong practical progression from applying basic commands to evaluating system performance through implementation.

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MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

CS453PC: Database Management Systems Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage
CS453PC.1	**Apply** SQL commands (DDL, DML, DCL, TCL) to **design and manage** relational database schemas using ER models.	3	Applying	Experiments 1 – 4 (ER model creation, normalization, basic SQL)
CS453PC.2	**Develop** advanced SQL queries, subqueries, joins, and **implement** PL/SQL features like functions, procedures, and triggers to perform data manipulation and control.	4	Analyzing	Experiments 5 – 8 (SQL queries, joins, views, PL/SQL blocks, triggers)
CS453PC.3	**Design** and **evaluate** a complete database application integrating multiple tables, queries, and PL/SQL components for real-world problem solving.	5	Evaluating	Experiments 9 – 12 (Mini Project / Case study)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	-	3	-	-	-	-	-	-	1	2	3	2	-
CO2	3	3	3	1	3	-	-	-	-	-	-	1	2	3	2	-
CO3	3	3	3	2	3	-	-	-	1	1	1	2	2	3	3	2
Average	**2.67**	**2.67**	**2.67**	**1**	**3**	**–**	**–**	**–**	**0.33**	**0.33**	**0.33**	**1.33**	**2**	**3**	**2.33**	**0.67**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5 (Modern Tool Usage)** – Extensive use of DBMS software (Oracle, MySQL), SQL, and PL/SQL tools. **PSO2 (Software Development)** – Direct development of database applications using programming and query languages. **PSO3 (Mathematical Concepts)** – Applies relational algebra, normalization, and set theory in practical scenarios.
Moderate (2)	**PO1 (Engineering Knowledge)** – Applies database principles in practical implementations. **PO2 (Problem Analysis)** – Analyzes data requirements and designs appropriate schemas. **PO3 (Design/Development)** – Designs and develops complete database applications. **PSO1 (Computer Systems)** – Works with database storage and retrieval systems.
Minor (1)	**PO4 (Investigations)** – Investigates query performance and optimization. **PO9 (Individual & Team Work)** – Collaborative work in mini-projects. **PO10 (Communication)** – Documentation of database designs. **PO11 (Project Management)** – Mini-project planning and execution. **PO12 (Life-long Learning)** – Foundation for continuous database learning. **PSO4 (Research Ability)** – Applied research in database design.
No Mapping	**PO6, PO7, PO8** – Societal, environmental, and ethical outcomes not directly covered in lab context.
Cognitive Range	**BTL 3-5 (Applying → Evaluating)** – Strong practical progression from basic SQL application to complete database system evaluation.

MR21 – Revised Course Outcome
B.Tech. IV Semester

Regulation: MR21 **Year/Sem: II /II** **Department: IT**

CS455PC: Java Programming Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
CS455PC.1	**Apply** fundamental Java syntax, control structures, and object-oriented concepts such as classes, objects, and constructors to **develop** modular programs.	3	Applying	Experiments 1–4 (OOP basics, class/object, inheritance, constructors)
CS455PC.2	**Implement** exception handling, multithreading, packages, and interfaces to **analyze** program performance and reusability.	4	Analyzing	Experiments 5–8 (Packages, threads, exceptions, polymorphism)
CS455PC.3	**Design** and **develop** GUI-based Java applications integrating file handling, AWT/Swing components, and event-driven programming for real-world problems.	5	Evaluating	Experiments 9–12 (File handling, GUI, applets, mini project)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	-	3	-	-	-	-	-	-	1	2	3	1	-
CO2	3	3	3	1	3	-	-	-	-	-	-	1	2	3	2	-
CO3	3	3	3	2	3	-	-	-	1	1	1	2	2	3	3	2
Average	**2.67**	**2.67**	**2.67**	**1**	**3**	**–**	**–**	**–**	**0.33**	**0.33**	**0.33**	**1.33**	**2**	**3**	**2**	**0.67**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5 (Modern Tool Usage)** – Extensive use of Java development tools (Eclipse/NetBeans), debugging tools, and GUI builders. **PSO2 (Software Development)** – Core focus on Java programming, OOP principles, and application development.
Moderate (2)	**PO1 (Engineering Knowledge)** – Applies programming fundamentals and software engineering principles. **PO2 (Problem Analysis)** – Analyzes problems to develop Java-based solutions. **PO3 (Design/Development)** – Designs and develops complete Java applications with GUI and file handling.
Minor (1)	**PO4 (Investigations)** – Investigates program performance through multithreading and optimization. **PO9 (Individual & Team Work)** – Collaborative work in mini-projects. **PO10 (Communication)** – Documentation and presentation of Java applications. **PO11 (Project Management)** – Mini-project planning and execution. **PO12 (Life-long Learning)** – Foundation for continuous programming skill development. **PSO4 (Research Ability)** – Applied research in software development.
No Mapping	**PO6, PO7, PO8** – Societal, environmental, and ethical outcomes not directly covered in lab context.
Cognitive Range	**BTL 3-5 (Applying → Evaluating)** – Strong practical progression from basic programming to designing and evaluating complete applications.

MR21 – Revised Course Outcome
B.Tech. IV Semester
Regulation: MR21 **Year/Sem: II /II** **Department: IT**

EN452HS: Finishing School- II

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
EN452HS.1	**Apply** verbal and non-verbal communication techniques to **demonstrate** effective interactions in interviews, group discussions, and presentations.	3	Applying	Unit I – Advanced Communication & Interview Skills
EN452HS.2	**Develop** problem-solving and quantitative aptitude skills by **analyzing** numerical, logical, and reasoning problems.	4	Analyzing	Unit II – Quantitative & Analytical Aptitude
EN452HS.3	**Illustrate** critical and creative thinking strategies to **solve** case-based or situational problems in professional contexts.	4	Analyzing	Unit III – Critical Thinking & Decision Making
EN452HS.4	**Demonstrate** professional etiquette, teamwork, and leadership through **role-plays**, mock sessions, and group projects.	5	Evaluating	Unit IV – Team Building & Leadership Skills
EN452HS.5	**Design** a personal career development plan by **integrating** soft skills, aptitude, and domain competencies for lifelong employability.	5	Evaluating	Unit V – Career Planning & Personality Development

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	-	-	-	2	3	-	1	-	-	-	-
CO2	1	2	1	1	-	-	-	-	1	1	-	2	-	-	2	-
CO3	1	2	1	1	-	-	-	-	2	1	-	2	-	-	2	-
CO4	-	-	-	-	-	1	-	2	3	2	1	2	-	-	-	-
CO5	-	-	-	-	-	-	-	1	2	1	2	3	-	-	-	1
Average	**0.4**	**0.8**	**0.4**	**0.4**	**–**	**0.2**	**–**	**0.6**	**2**	**1.6**	**0.6**	**2**	**–**	**–**	**0.8**	**0.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO9 (Individual and Team Work)** – Direct focus on teamwork, leadership, and collaborative activities. **PO10 (Communication)** – Core emphasis on verbal/non-verbal communication, presentations, and group discussions. **PO12 (Life-long Learning)** – Career planning and continuous skill development for employability.
Moderate (2)	**PO8 (Ethics)** – Professional etiquette and ethical behavior in workplace scenarios. **PO11 (Project Management)** – Implicit in career planning and project-based role-plays. **PSO4 (Research Ability)** – Critical thinking and problem-solving applicable to research contexts.
Minor (1)	**PO2 (Problem Analysis)** – Through quantitative and analytical aptitude. **PO6 (The Engineer and Society)** – Professional conduct in societal context. **PSO3 (Mathematical Concepts)** – Application in quantitative reasoning. **PO1, PO3, PO4** – Indirectly through logical and structured thinking.
No Mapping	**PO5, PO7, PSO1, PSO2** – Technical tools, environmental aspects, hardware, and software development not covered.
Cognitive Range	**BTL 3-5 (Applying → Evaluating)** – Strong emphasis on applying soft skills, analyzing situations, and evaluating professional behavior.

MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

CS501PC: Theory of Computation

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS501PC.1	**Explain** the concepts and working of **Finite Automata (DFA, NFA)**, and **convert** between NFA and DFA, including machines with epsilon-transitions.	2	Understanding	Unit I
CS501PC.2	**Apply** the concepts of **regular expressions** and the **pumping lemma** to prove language properties and **convert** finite automata to regular expressions.	3	Applying	Unit II
CS501PC.3	**Design Context-Free Grammars (CFGs)** and **Pushdown Automata (PDA)** for formal languages and **analyze** their equivalence.	6	Creating	Unit III
CS501PC.4	**Analyze** context-free grammars by **converting** them into **normal forms (CNF, GNF)** and **apply** the pumping lemma for CFLs.	4	Analyzing	Unit IV
CS501PC.5	**Evaluate** the computational power of **Turing Machines** and **distinguish** between **decidable and undecidable problems**.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	-	-	-	-	-	-	-	1	-	1	2	1	3	-
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	2	3	-
CO3	3	3	3	1	-	-	-	-	-	-	-	2	2	2	3	-
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	2	3	1
CO5	3	3	2	2	-	-	-	-	-	-	-	2	2	1	3	2
Average	**2.8**	**2.8**	**1.8**	**1.0**	**-**	**-**	**-**	**-**	**-**	**0.2**	**-**	**1.6**	**2.0**	**1.6**	**3.0**	**0.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO3:** The course provides core **engineering knowledge (PO1)** in theoretical computer science and the foundation for **analyzing complex problems (PO2)**. It is deeply rooted in and develops **mathematical foundations (PSO3)**.
Moderate (2)	**PO3, PO12, PSO1, PSO2:** Students **design (PO3)** abstract computational models. The subject fosters **lifelong learning (PO12)**. It establishes the logical principles of **computer systems (PSO1)** and **software structure (PSO2)**.
Minor (1)	**PO4, PO10, PSO4:** The course involves **investigation (PO4)** of problem decidability. **Communication (PO10)** is used to explain theoretical concepts. It introduces open research problems like P vs NP **(PSO4)**.
No Mapping	**PO5, PO6, PO7, PO8, PO9, PO11:** The course is purely theoretical with no modern tools, societal/ethical context, teamwork, project management, or finance.
Cognitive Range	**BTL 2 → 6:** Clear progression from understanding automata to applying conversions, designing grammars, analyzing language properties, and evaluating computational limits.

MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

CS503PC: Design and Analysis of Algorithms

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS503PC.1	**Analyze** the **complexity** of algorithms using **asymptotic notations** and **apply divide-and-conquer** to solve problems like sorting and matrix multiplication.	4	Analyzing	Unit I
CS503PC.2	**Apply greedy method** strategies to solve optimization problems such as **job sequencing, knapsack, and minimum spanning trees**.	3	Applying	Unit II
CS503PC.3	**Develop** efficient solutions using **dynamic programming** for problems including **multistage graphs, TSP, and 0/1 knapsack**.	6	Creating	Unit III
CS503PC.4	**Design** algorithms using **backtracking** and **branch and bound** techniques for problems like **graph coloring and the 8-Queens problem**.	6	Creating	Unit IV
CS503PC.5	**Evaluate** and **classify** computational problems into **complexity classes (P, NP, NP-Complete)**.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	-	-	-	-	-	-	-	-	1	2	1	3	-
CO2	3	3	2	-	-	-	-	-	-	-	-	1	2	2	3	-
CO3	3	3	3	1	-	-	-	-	-	-	-	2	2	2	3	-
CO4	3	3	3	2	-	-	-	-	1	-	1	2	2	2	2	1
CO5	3	3	2	2	-	-	-	-	-	-	-	2	2	1	3	2
Average	**3.0**	**3.0**	**2.2**	**1.0**	**-**	**-**	**-**	**-**	**0.2**	**-**	**0.2**	**1.6**	**2.0**	**1.6**	**2.8**	**0.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO2, PSO3:** This is a core course providing **engineering knowledge (PO1)** and advanced **problem analysis (PO2)** skills. It is fundamentally based on **mathematical reasoning (PSO3)** for complexity analysis.
Moderate (2)	**PO3, PO12, PSO1, PSO2:** Students **design/develop (PO3)** efficient algorithms. The evolving nature of algorithms fosters **lifelong learning (PO12)**. It is crucial for building efficient **systems (PSO1)** and **software (PSO2)**.
Minor (1)	**PO4, PO9, PO11, PSO4:** The course involves **investigation (PO4)** of algorithm efficiency. Lab work implies **teamwork (PO9)** and **project management (PO11)**. It introduces the research frontier of NP-completeness **(PSO4)**.
No Mapping	**PO5, PO6, PO7, PO8, PO10:** No specific tool usage, societal/ethical/environmental context, or formal communication focus.
Cognitive Range	**BTL 3 → 6:** Strong emphasis on high-order thinking, from applying strategies to creating new algorithms and evaluating complexity classes.

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MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

CS504PC: Software Engineering

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS504PC.1	**Compare** various software process models and **analyze** the framework of software engineering as a layered technology.	4	Analyzing	Unit I
CS504PC.2	**Develop** Software Requirements Specification **(SRS)** documents by **applying** software process models and requirements engineering processes.	3	Applying	Unit II
CS504PC.3	**Design** software architectures and component-level models using UML diagrams.	6	Creating	Unit III
CS504PC.4	**Formulate** comprehensive test strategies by integrating various testing levels and techniques.	5	Evaluating	Unit IV
CS504PC.5	**Evaluate** software quality using product metrics and recommend improvements based on quality management principles.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	1	–	1	–	1	–	–	1	2	1	–
CO2	2	3	3	2	2	1	–	1	1	3	1	1	–	3	1	–
CO3	2	2	3	2	3	–	–	–	1	3	1	2	–	3	2	1
CO4	2	3	2	3	2	–	–	–	–	2	1	1	–	2	1	1
CO5	2	3	2	2	2	1	1	1	–	2	2	1	–	1	2	1
Average	**2.2**	**2.8**	**2.4**	**2.2**	**2.2**	**1**	**1**	**1**	**1**	**2.2**	**1.25**	**1.25**	**1**	**2.2**	**1.4**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO3, PSO2:** Strongly mapped because the course emphasizes **problem analysis, design of solutions using UML/architecture**, and **software development methodologies.**
Moderate (2)	**PO1, PO4, PO5, PO10, PO11, PO12, PSO1:** Moderately mapped as the course provides **engineering fundamentals, investigation skills, conceptual tool usage, documentation & communication, process/metrics-based management, lifelong learning**, and **system-level understanding.**
Minor (1)	**PO6, PO7, PO8, PO9, PSO3, PSO4:** Lightly mapped due to basic relevance in **societal aspects, maintainability/sustainability, ethics (SQA), agile teamwork, metrics/analysis**, and **introductory research exposure.**
No Mapping	Applied only where the syllabus does not justify a direct linkage.
Cognitive Range	**BTL 3–6:** Course covers applying, analysing, evaluating, and creating through SRS, design, testing, and quality evaluation.

MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

CS507PC: Web Technologies

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS507PC.1	**Develop** interactive web pages using **HTML, CSS, and JavaScript**, including form validation and an introduction to AJAX.	3	Applying	Unit I
CS507PC.2	**Construct** well-formed **XML** documents and **process** them using **DOM and SAX parsers**.	3	Applying	Unit II
CS507PC.3	**Build** server-side scripts using **PHP** for form handling, file operations, sessions, and database connectivity.	3	Applying	Unit III
CS507PC.4	**Develop** server-side applications using **Java Servlets** to handle HTTP requests, responses, and manage sessions.	3	Applying	Unit IV
CS507PC.5	**Design** dynamic web applications using **JavaServer Pages (JSP)** and **implement** session tracking.	6	Creating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	-	2	-	-	1	1	1	-	1	2	2	1	1
CO2	2	2	2	1	2	-	-	1	1	1	-	1	2	2	1	1
CO3	2	2	3	1	2	-	-	1	1	1	1	2	2	3	1	1
CO4	2	2	3	1	2	-	-	1	1	1	1	2	2	3	1	1
CO5	2	3	3	2	3	-	-	2	2	2	2	3	2	3	1	2
Average	**2.0**	**2.2**	**2.6**	**1.0**	**2.2**	**-**	**-**	**1.2**	**1.2**	**1.2**	**0.8**	**1.8**	**2.0**	**2.6**	**1.0**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5, PSO2:** The course is heavily reliant on using **modern tools (PO5)** for web development. It is a direct application of **software development methodologies (PSO2)**.
Moderate (2)	**PO1, PO2, PO3, PO12, PSO1:** Provides foundational **engineering knowledge (PO1)**. Involves **problem-solving (PO2)** and **design (PO3)** of web apps. Requires **lifelong learning (PO12)** to keep pace with web tech. Builds **computer systems (PSO1)** knowledge.
Minor (1)	**PO4, PO8, PO9, PO10, PO11, PSO3, PSO4:** Involves **investigation (PO4)** for debugging. Touches on **ethics (PO8)** in web. Implies **teamwork (PO9)** and **communication (PO10)**. Requires **project management (PO11)**. Uses basic **math (PSO3)**. Can inspire **research (PSO4)** in new frameworks.
No Mapping	**PO6, PO7:** No direct societal or environmental context is covered.
Cognitive Range	**BTL 3 → 6:** Focuses on applying various web technologies, culminating in the creation of a complete web application.

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MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

IT501PC: Data Communication and Computer Networks

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT501PC.1	**Explain** data communication components, network models (OSI, TCP/IP), physical layer transmission media, and switching techniques.	2	Understanding	Unit I
IT501PC.2	**Apply** error detection/correction methods (CRC, Hamming code) and flow control protocols at the data link layer, and analyze multiple access protocols.	3	Applying	Unit II
IT501PC.3	**Analyze** network layer functions including IP addressing (IPv4, IPv6), routing algorithms, and forwarding techniques.	4	Analyzing	Unit III
IT501PC.4	**Evaluate** transport layer protocols (UDP, TCP), congestion control mechanisms, and Quality of Service (QoS) parameters.	5	Evaluating	Unit IV
IT501PC.5	**Illustrate** the working of application layer protocols including DNS, SMTP, FTP, and HTTP in internet applications.	2	Understanding	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	1	-	2	3	1	2	-
CO2	3	3	2	1	-	-	-	-	-	-	-	2	3	2	2	1
CO3	3	3	2	2	-	-	-	-	-	-	-	2	3	2	2	1
CO4	3	3	2	2	-	-	-	-	-	-	-	2	3	2	2	1
CO5	2	2	1	-	-	-	-	-	-	1	-	2	2	2	1	1
Average	**2.8**	**2.6**	**1.6**	**1.0**	**-**	**-**	**-**	**-**	**-**	**0.4**	**-**	**2.0**	**2.8**	**1.8**	**1.8**	**0.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PSO1:** Provides core **engineering knowledge** in networking fundamentals and deep understanding of **computer systems** architecture and protocols.
Moderate (2)	**PO2, PO3, PO4, PO12, PSO2, PSO3:** Strong **problem analysis** in protocol design, network **design** principles, **investigation** of network performance, **lifelong learning** in evolving technologies, **software development** for network applications, and **mathematical** foundations of error control.
Minor (1)	**PO10, PSO4:** Basic **communication** of network concepts and **research** context in emerging networking technologies.
No Mapping	**PO5, PO6, PO7, PO8, PO9, PO11:** No tool usage, societal, environmental, ethical, teamwork, or project management focus.
Cognitive Range	**BTL 2 → 5:** Clear progression from understanding concepts to evaluating protocol performance and QoS mechanisms.

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MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

CE521OE: Disaster Preparedness and Planning Management (Open Elective-I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CE521OE.1	Define the fundamental concepts and terminology of disaster management, including disaster, hazard, vulnerability, risk, and resilience.	1	Remember	Unit I
CE521OE.2	Classify different types of natural and man-made disasters and describe the hazard and vulnerability profile of India.	2	Understand	Unit II
CE521OE.3	Explain the environmental, social, economic, and health impacts of disasters and describe global and national disaster trends.	2	Understand	Unit III
CE521OE.4	Illustrate the phases of the disaster management cycle and summarize the structural, non-structural measures, and key policies for Disaster Risk Reduction (DRR) in India.	2	Understand	Unit IV
CE521OE.5	Analyze the impact of developmental projects on disaster vulnerability and identify principles of sustainable and environmentally friendly reconstruction.	4	Analyze	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	-	-	-	1	1	-	-	-	-	1	-	-	-	1
CO2	2	1	-	-	-	2	2	-	-	-	-	1	-	-	-	1
CO3	2	1	-	-	-	2	2	-	-	-	-	1	-	-	-	1
CO4	2	2	1	1	-	3	2	1	1	1	2	1	-	-	-	1
CO5	2	3	2	2	-	3	3	2	-	-	1	1	-	-	-	2
Average	**2.0**	**1.6**	**0.6**	**0.6**	**-**	**2.2**	**2.0**	**0.6**	**0.2**	**0.2**	**0.6**	**1.0**	**-**	**-**	**-**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO6** - Core focus on societal protection through disaster management (COs 2,3,4,5) **PO7** - Environmental impact analysis and sustainable reconstruction (CO5)
Moderate (2)	**PO1** - Foundational disaster science principles **PO2** - Vulnerability analysis and DRR strategy evaluation (CO4,5) **PSO4** - Broadens IT perspective for disaster management applications
Minor (1)	**PO4** - Policy and case study analysis **PO8** - Ethical considerations in development **PO11** - Disaster management cycle as project management **PO12** - Dynamic field requiring continuous learning
No Mapping	**PO3, PO5, PO9, PO10, PSO1, PSO2, PSO3** - Not addressed in course content or COs
Cognitive Range	**BTL 1-4** - Appropriate for introductory elective: builds foundation (BTL 1-2) before analytical skills (BTL 4)

MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

MC501HS: Intellectual Property Rights

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC501HS.1	**Explain** the fundamentals, types, and importance of Intellectual Property Rights and international organizations governing IPR.	2	Understanding	Unit I – Introduction to IPR
MC501HS.2	**Apply** procedures for filing patents, copyrights, and trademarks and interpret legal requirements for protection.	3	Applying	Unit II – Patents, Copyrights & Trademarks
MC501HS.3	**Analyze** the role of trade secrets, geographical indications, and industrial designs in innovation and global trade.	4	Analyzing	Unit III – Other Forms of Intellectual Property
MC501HS.4	**Evaluate** national and international IPR frameworks, policies, and agreements such as WIPO, WTO, and TRIPS.	5	Evaluating	Unit IV – IPR Frameworks & Organizations
MC501HS.5	**Formulate** ethical and legal strategies to protect intellectual property in innovation and entrepreneurship scenarios.	6	Creating	Unit V – Case Studies & Legal Implications

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	-	-	-	2	-	2	-	1	-	2	-	1	-	1
CO2	1	2	1	-	-	2	-	3	-	2	1	2	-	2	-	2
CO3	1	2	1	1	-	2	-	3	-	2	1	2	-	2	-	2
CO4	1	2	1	2	-	3	-	3	-	2	2	2	-	2	-	2
CO5	1	2	2	2	-	3	-	3	1	2	2	3	-	2	-	3
Average	**1**	**1.8**	**1**	**1**	**–**	**2.4**	**–**	**2.8**	**0.2**	**1.8**	**1.2**	**2.2**	**–**	**1.8**	**–**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO8, PO6** - Strong ethical, legal, and societal implications of intellectual property; understanding of legal compliance and professional responsibilities.
Moderate (2)	**PO2, PO10, PO11, PO12, PSO-2, PSO-4** - Problem analysis in IP contexts, communication of legal concepts, project and innovation management, lifelong learning.
Minor (1)	**PO1, PO3, PO4, PO5, PO9, PSO-1, PSO-3** - Basic engineering relevance, design considerations, investigation, and limited tool usage or teamwork.
No Mapping	**PO7** - No direct environmental focus.
Cognitive Range	**BTL 2-6** - Clear progression from understanding IP concepts to creating protection strategies.

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MR21 – Revised Course Outcome
B.Tech. V Semester

Regulation: MR21 **Year/Sem: III /I** **Department: IT**

MC501ES/ MC601ES: Artificial Intelligence

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC501ES.1	**Explain** the fundamentals, history, scope, and applications of Artificial Intelligence and intelligent agents.	2	Understanding	Unit I – Introduction to AI
MC501ES.2	**Apply** search strategies, constraint satisfaction, and game theory techniques to solve AI problems.	3	Applying	Unit II – Problem Solving & Search
MC501ES.3	**Analyze** knowledge representation schemes, logic-based reasoning, and inference mechanisms.	4	Analyzing	Unit III – Knowledge Representation & Reasoning
MC501ES.4	**Design** and **implement** machine learning algorithms including decision trees and classification models.	6	Creating	Unit IV – Machine Learning Concepts
MC501ES.5	**Evaluate** AI models for real-world applications and **assess** ethical implications in AI systems.	5	Evaluating	Unit V – Applications & Ethical Issues

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	-	1	-	1	-	1	-	2	2	1	2	1
CO2	2	3	2	1	1	-	-	-	-	-	-	2	2	2	3	1
CO3	2	3	2	2	1	-	-	-	-	-	-	2	2	2	3	1
CO4	2	3	3	2	2	-	-	-	1	1	1	2	2	3	2	2
CO5	2	3	2	2	1	2	1	2	1	2	1	2	2	2	2	2
Average	**2**	**2.8**	**2**	**1.4**	**1**	**0.6**	**0.2**	**0.6**	**0.4**	**0.8**	**0.4**	**2**	**2**	**2**	**2.4**	**1.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PSO-3** - Strong problem-solving and analytical skills in AI techniques; mathematical foundation for algorithms.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-1, PSO-2, PSO-4** - Engineering knowledge, design principles, investigation, lifelong learning, and research applications.
Minor (1)	**PO5, PO6, PO7, PO8, PO9, PO10, PO11** - Basic tool usage, societal impact, ethics, teamwork, and project management.
No Mapping	-
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding AI concepts to creating ML solutions and evaluating ethical implications.

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B.Tech. V Semester
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CS551PC: Software Engineering Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
CS551PC.1	**Develop** problem statements and **prepare** Software Requirement Specification (SRS), Design, and Testing documents for given projects.	3	Applying	Experiments 1-3
CS551PC.2	**Apply** CASE tools for software design and **develop** test cases for unit testing, integration testing, and various testing techniques.	3	Applying	Experiments 4-7
CS551PC.3	**Design** and **implement** a complete software project by applying software engineering principles across all development phases.	6	Creating	All Sample Projects

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	1	1	–	–	1	1	2	1	2	2	3	1	1
CO2	2	3	3	2	2	–	–	1	1	2	1	2	2	3	1	2
CO3	2	3	3	2	2	–	–	2	2	3	2	2	2	3	1	2
Average	**2.0**	**3.0**	**2.7**	**1.7**	**1.7**	**–**	**–**	**1.3**	**1.3**	**2.3**	**1.3**	**2.0**	**2.0**	**3.0**	**1.0**	**1.7**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PSO2:** The lab focuses intensely on **problem analysis** through requirement gathering and **software development** by implementing projects using engineering methodologies.
Moderate (2)	**PO1, PO3, PO4, PO5, PO10, PO12, PSO1, PSO4:** Applies **engineering knowledge** to **design** solutions, **investigate** requirements, use **modern tools** (CASE), **communicate** via documentation, engage in **lifelong learning**, understand **system fundamentals**, and conduct project-based **research**.
Minor (1)	**PO8, PO9, PO11, PSO3:** Involves basic **ethical** documentation, **teamwork** in projects, **project management**, and application of **mathematical** concepts in testing.
No Mapping	**PO6, PO7:** No direct societal or environmental context.
Cognitive Range	**BTL 3 → 6:** Practical progression from applying documentation skills to creating complete software projects.

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CS556PC: Computer Networks & Web Technologies Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
CS556PC.1 (CN)	**Implement** data link layer framing, error detection codes, and flow control mechanisms.	3	Applying	CN Experiments 1-3
CS556PC.2 (CN)	**Analyze** network routing, congestion control, and protocol performance using simulation tools.	4	Analyzing	CN Experiments 4-13
CS556PC.3 (WT)	**Develop** web applications using PHP for server-side scripting and database operations.	3	Applying	WT Experiments 1-4
CS556PC.4 (WT)	**Design** and **deploy** full-stack web applications integrating client-side and server-side technologies.	6	Creating	WT Experiments 5-9

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	1	2	–	–	1	1	1	–	2	3	2	2	1
CO2	2	3	2	2	2	–	–	1	1	1	–	2	3	2	2	1
CO3	2	2	3	2	2	–	–	1	1	2	1	2	2	3	1	2
CO4	2	3	3	2	3	–	–	1	2	2	2	2	2	3	1	2
Average	**2.0**	**2.8**	**2.5**	**1.8**	**2.3**	**–**	**–**	**1.0**	**1.3**	**1.5**	**0.8**	**2.0**	**2.5**	**2.5**	**1.5**	**1.5**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO1, PSO2:** Strong **problem analysis** in networking and web development, extensive use of **modern tools** (simulators, web stacks), deep understanding of **computer systems**, and application of **software development** methodologies.
Moderate (2)	**PO1, PO3, PO4, PO10, PO12, PSO3, PSO4:** Application of **engineering knowledge**, **design** of network and web solutions, **investigation** of protocol performance, **communication** through documentation, **lifelong learning** in evolving technologies, use of **mathematical** models, and **research** in project implementation.
Minor (1)	**PO8, PO9, PO11:** Basic **ethical** considerations in networking, **teamwork** in labs, and **project management** for web applications.
No Mapping	**PO6, PO7:** No societal or environmental context.
Cognitive Range	**BTL 3 → 6:** Clear progression from implementing protocols to designing and deploying full-stack applications.

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EN553HS: Finishing School III (Advanced Communication Skills Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Module
EN553HS.1	**Apply** advanced oral and written communication skills in interviews, group discussions, and professional interactions.	3	Applying	Modules 1–2 (Presentation skills, Interview techniques, GDs)
EN553HS.2	**Analyze** and **apply** critical thinking and business etiquette in corporate communication and decision-making scenarios.	4	Analyzing	Modules 3–4 (Corporate communication, Decision making, Email & report writing)
EN553HS.3	**Design** a professional development plan integrating leadership, teamwork, and lifelong learning strategies.	6	Creating	Module 5 (Leadership, Career planning, Self-assessment, Resume building)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	–	–	–	–	–	1	–	2	2	3	1	2	–	1	–	1
CO2	–	–	–	1	–	2	–	2	2	3	2	2	–	2	–	2
CO3	–	–	–	1	–	2	–	2	3	3	2	3	–	2	–	2
Average	**–**	**–**	**–**	**0.67**	**–**	**1.67**	**–**	**2**	**2.33**	**3**	**1.67**	**2.33**	**–**	**1.67**	**–**	**1.67**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10, PO9, PO12** – Strong communication, teamwork, and lifelong learning skills directly developed through lab activities.
Moderate (2)	**PO8, PO11, PO6, PSO-2, PSO-4** – Ethics, project management, societal interaction, professional skills, and research communication.
Minor (1)	**PO4, PSO-1** – Basic investigation and computer systems awareness.
No Mapping	**PO1, PO2, PO3, PO5, PO7, PSO-3** – No direct technical, mathematical, or environmental focus.
Cognitive Range	**BTL 3–6** – Clear progression from applying communication skills to creating professional development plans.

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IT601PC : Introduction to Embedded Systems

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT601PC.1	Explain the fundamental concepts, characteristics, and classification of embedded systems and their application areas.	2	Understand	Unit I
IT601PC.2	Identify the core components of an embedded system including processors, memory, sensors, actuators, and communication interfaces.	2	Understand	Unit II
IT601PC.3	Describe the functionality of system components like reset circuits, watchdog timers, and compare firmware design approaches.	2	Understand	Unit III
IT601PC.4	Analyze different task scheduling algorithms and operating system concepts in RTOS-based embedded systems.	4	Analyze	Unit IV
IT601PC.5	Evaluate task communication methods and synchronization issues in embedded systems design.	5	Evaluate	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	1	-	-	-	-	-	1	3	1	-	1
CO2	3	2	2	1	1	1	-	-	-	-	-	-	3	2	-	1
CO3	3	2	2	1	1	1	-	-	-	-	-	-	3	2	-	1
CO4	3	3	2	2	1	-	-	-	-	-	-	-	2	2	2	2
CO5	3	3	2	2	1	-	-	-	-	-	-	-	2	2	2	2
Average	**3.0**	**2.4**	**1.8**	**1.2**	**0.8**	**0.6**	**-**	**-**	**-**	**-**	**-**	**0.2**	**2.6**	**1.8**	**0.8**	**1.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1** - Core engineering knowledge of embedded systems architecture **PSO1** - Fundamental computer system concepts
Moderate (2)	**PO2** - Problem analysis in system design **PO3** - Design of embedded solutions **PSO2** - Software development for hardware systems
Minor (1)	**PO4** - Investigation of system components **PO5** - Tool usage in embedded design **PO6** - Societal applications **PSO3/PSO4** - Mathematical and research applications
No Mapping	**PO7, PO8, PO9, PO10, PO11** - Not directly addressed
Cognitive Range	**BTL 2-5** - Balanced progression from understanding to evaluation

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IT602PC: Internet of Things

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT602PC.1	**Explain** the fundamental concepts, architecture, and enabling technologies of IoT systems.	2	Understanding	Unit I – IoT Introduction
IT602PC.2	**Compare** IoT with M2M systems and **analyze** the role of SDN and NFV in IoT infrastructure.	4	Analyzing	Unit II – IoT Concepts
IT602PC.3	**Develop** Python scripts for IoT applications using data structures, control flow, and relevant packages.	3	Applying	Unit III – IoT Systems using Python
IT602PC.4	**Interface** sensors and actuators with IoT devices such as Raspberry Pi and **implement** basic IoT applications.	3	Applying	Unit IV – IoT Physical Devices & Endpoints
IT602PC.5	**Design** and **evaluate** cloud-based IoT solutions using web services and messaging platforms.	6	Creating	Unit V – IoT Physical Servers & Cloud Offerings

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	-	1	-	1	-	1	-	2	2	1	1	1
CO2	2	3	2	1	-	1	-	1	-	-	-	2	2	2	2	1
CO3	2	3	2	1	2	-	-	1	1	1	-	2	2	2	2	1
CO4	2	3	3	2	2	-	-	1	1	1	-	2	3	2	2	1
CO5	2	3	3	2	3	1	-	1	1	2	2	2	2	3	1	2
Average	**2**	**2.8**	**2.2**	**1.2**	**1.4**	**0.6**	**–**	**1**	**0.6**	**1**	**0.4**	**2**	**2.2**	**2**	**1.6**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-1, PSO-2** - Strong problem analysis, modern tool usage (Raspberry Pi, Python, Cloud), computer systems understanding, and software development.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-3, PSO-4** - Engineering knowledge, design principles, investigation, lifelong learning, and mathematical applications.
Minor (1)	**PO6, PO8, PO9, PO10, PO11** - Basic societal impact, ethics, teamwork, communication, and project management.
No Mapping	**PO7** - No direct environmental focus.
Cognitive Range	**BTL 2-6** - Clear progression from understanding IoT concepts to designing cloud-based solutions.

MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

CS604PC: Compiler Design

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS604PC.1	**Explain** the phases and structure of a compiler and **identify** the role of each phase in program translation.	2	Understanding	Unit I – Introduction to Compilers
CS604PC.2	**Apply** lexical and syntax analysis techniques using finite automata and parsing algorithms.	3	Applying	Unit II – Lexical & Syntax Analysis
CS604PC.3	**Analyze** syntax-directed translation schemes and **construct** intermediate code representations.	4	Analyzing	Unit III – Syntax Directed Translation & Intermediate Code
CS604PC.4	**Evaluate** code optimization techniques and **compare** different optimization strategies for improving performance.	5	Evaluating	Unit IV – Code Optimization
CS604PC.5	**Design** target code generation schemes and **implement** a simple compiler for a subset of a programming language.	6	Creating	Unit V – Code Generation & Runtime Environment

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	-	-	-	-	-	1	-	2	2	1	3	-
CO2	2	3	2	1	1	-	-	-	-	-	-	2	2	2	3	1
CO3	2	3	2	2	1	-	-	-	-	-	-	2	2	2	3	1
CO4	2	3	2	2	1	-	-	-	-	-	-	2	2	2	3	1
CO5	2	3	3	2	2	-	-	-	1	1	1	2	2	3	1	2
Average	**2**	**2.8**	**2**	**1.4**	**1**	**–**	**–**	**–**	**0.2**	**0.4**	**0.2**	**2**	**2**	**2**	**2.6**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3, PO2** - Strong mathematical foundations in automata theory, parsing algorithms, and problem analysis in compiler design.
Moderate (2)	**PO1, PO3, PO4, PO5, PO12, PSO-1, PSO-2** - Engineering knowledge, design principles, investigation, tool usage, and software development skills.
Minor (1)	**PO9, PO10, PO11, PSO-4** - Basic teamwork, communication, project management, and research context.
No Mapping	**PO6, PO7, PO8** - No direct societal, environmental, or ethical considerations.
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding compiler phases to designing code generation schemes.

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IT612PE: Data Analytics - (Professional Elective I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT612PE.1	**Explain** data management concepts, data architecture, and data quality dimensions for analytics applications.	2	Understanding	Unit I – Data Management
IT612PE.2	**Apply** data analytics tools and techniques for business modeling and statistical analysis.	3	Applying	Unit II – Data Analytics
IT612PE.3	**Analyze** regression models and variable rationalization techniques for predictive analytics.	4	Analyzing	Unit III – Regression
IT612PE.4	**Evaluate** segmentation techniques and time series methods for forecasting and pattern recognition.	5	Evaluating	Unit IV – Object Segmentation
IT612PE.5	**Design** data visualization solutions using appropriate techniques for effective business intelligence.	6	Creating	Unit V – Data Visualization

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	1	-	1	-	1	-	2	2	2	2	1
CO2	2	3	2	2	2	1	-	1	1	1	1	2	2	3	2	2
CO3	2	3	2	2	2	1	-	1	1	1	1	2	2	3	3	2
CO4	2	3	2	2	2	1	-	1	1	1	1	2	2	3	3	2
CO5	2	3	3	2	3	2	1	1	2	2	2	3	2	3	2	3
Average	**2**	**2.8**	**2**	**1.8**	**2**	**1.2**	**0.2**	**1**	**1**	**1.2**	**1**	**2.2**	**2**	**2.8**	**2.4**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-2, PSO-3** - Strong problem analysis in data analytics, modern tool usage (R, Python, SPSS), software development methodologies, and mathematical foundations for analytics.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-1, PSO-4** - Engineering knowledge, design of analytics solutions, investigation techniques, lifelong learning, and research applications.
Minor (1)	**PO6, PO8, PO9, PO10, PO11** - Basic societal impact awareness, ethics in data handling, teamwork, communication, and project management.
No Mapping	**PO7** - Limited environmental focus in data analytics context.
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding data concepts to designing visualization solutions.

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MR21 – Revised Course Outcome
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IT616PE: Python Programming (Professional Elective II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT616PE.1	**Explain** Python objects, data types, and standard type operations for effective programming.	2	Understanding	Unit I – Python Basics
IT616PE.2	**Apply** file handling, exception handling, and module systems for robust application development.	3	Applying	Unit II – Files & Modules
IT616PE.3	**Develop** applications using regular expressions and multithreaded programming concepts.	4	Analyzing	Unit III – Regular Expressions & Multithreading
IT616PE.4	**Design** GUI applications and web services using Python programming frameworks.	5	Evaluating	Unit IV – GUI & Web Programming
IT616PE.5	**Create** database applications using Python DB-API and object-relational mapping techniques.	6	Creating	Unit V – Database Programming

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	1	-	-	1	-	1	-	2	2	2	2	1
CO2	2	3	2	1	2	-	-	1	1	1	1	2	2	3	2	1
CO3	2	3	2	2	2	-	-	1	1	1	1	2	2	3	2	2
CO4	2	3	3	2	2	-	-	1	1	2	1	2	2	3	2	2
CO5	2	3	3	2	3	-	-	1	2	2	2	3	2	3	2	3
Average	**2**	**2.8**	**2.2**	**1.4**	**2**	**–**	**–**	**1**	**1**	**1.4**	**1**	**2.2**	**2**	**2.8**	**2**	**1.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-2** - Strong problem-solving using Python, modern tool proficiency, and software development skills.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-1, PSO-3, PSO-4** - Engineering knowledge, design principles, investigation, lifelong learning, and mathematical applications.
Minor (1)	**PO8, PO9, PO10, PO11** - Basic ethics, teamwork, communication, and project management.
No Mapping	**PO6, PO7** - No direct societal or environmental focus.
Cognitive Range	**BTL 2-6** - Comprehensive progression from basic concepts to advanced application development.

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MC602ES: Cyber Security

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC602ES.1	**Explain** fundamental cyber security concepts, threats, vulnerabilities, and security models for risk management.	2	Understanding	Unit I – Introduction to Cyber Security
MC602ES.2	**Analyze** cyber laws, digital forensics processes, and evidence handling in cyber crime investigations.	4	Analyzing	Unit II – Cyberspace Law & Cyber Forensics
MC602ES.3	**Evaluate** security challenges in mobile and wireless devices and identify protection mechanisms.	5	Evaluating	Unit III – Mobile & Wireless Security
MC602ES.4	**Assess** organizational implications of cyber crimes, IPR issues, and social media threats.	5	Evaluating	Unit IV – Organizational Implications
MC602ES.5	**Design** privacy protection strategies and data security measures for various application domains.	6	Creating	Unit V – Privacy Issues & Data Protection

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	1	-	2	1	2	-	1	-	2	1	1	1	1
CO2	1	2	1	2	-	3	1	3	-	2	1	2	1	1	1	2
CO3	1	2	1	2	1	2	1	2	-	1	1	2	1	1	1	2
CO4	1	2	1	2	-	3	1	3	1	2	2	2	1	1	1	2
CO5	1	2	2	2	1	3	2	3	1	2	2	3	1	1	1	3
Average	**1**	**2**	**1.2**	**1.8**	**0.4**	**2.6**	**1.2**	**2.6**	**0.4**	**1.6**	**1.2**	**2.2**	**1**	**1**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO6, PO8, PSO-4** - Strong societal impact awareness, ethical compliance in cyber security, and research in security solutions.
Moderate (2)	**PO2, PO4, PO7, PO10, PO11, PO12** - Problem analysis, investigation skills, environmental awareness, communication, project management, and lifelong learning.
Minor (1)	**PO1, PO3, PO5, PO9, PSO-1, PSO-2, PSO-3** - Basic engineering knowledge, design principles, tool usage, teamwork, and mathematical applications.
No Mapping	-
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding concepts to designing security strategies.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT651PC: Embedded Systems & Internet of Things Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT651PC.1	**Develop** and **implement** embedded system programs using 8051 microcontrollers for I/O operations, timers, interrupts, and serial communication.	4	Analyzing	ES Lab Experiments 1-7 (All 8051 programming exercises)
IT651PC.2	**Interface** sensors and actuators with multiple IoT platforms (Arduino, NodeMCU, Raspberry Pi) and **implement** data acquisition applications.	5	Evaluating	IoT Lab Experiments 1-7 (All sensor interfacing and monitoring applications)
IT651PC.3	**Design** and **integrate** complete embedded IoT systems by combining hardware interfacing, data processing, and application development.	6	Creating	Comprehensive project covering both ES & IoT concepts from all experiments

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	2	-	-	1	1	1	-	2	3	2	2	1
CO2	2	3	3	2	3	-	-	1	1	1	1	2	3	3	2	2
CO3	2	3	3	3	3	-	-	1	2	2	2	3	3	3	2	3
Average	**2**	**3**	**2.67**	**2.33**	**2.67**	**–**	**–**	**1**	**1.33**	**1.33**	**1**	**2.33**	**3**	**2.67**	**2**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-1, PSO-2** - Strong problem analysis, modern tool usage (microcontrollers, IoT platforms), computer systems understanding, and software development.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-3, PSO-4** - Engineering knowledge, design principles, investigation, lifelong learning, and research applications.
Minor (1)	**PO8, PO9, PO10, PO11** - Basic ethics, teamwork, communication, and project management.
No Mapping	**PO6, PO7** - No direct societal or environmental focus.
Cognitive Range	**BTL 4-6** - Practical progression from implementing to designing complete embedded IoT systems.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT652PC: Compiler Design Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT652PC.1	**Implement** lexical analyzers and parsers using LEX/YACC tools for syntax validation and token recognition.	4	Analyzing	Experiments 1, 7-10 (LEX programs, YACC implementations, grammar validation)
IT652PC.2	**Develop** and **analyze** various parsing algorithms including brute force, recursive descent, predictive, and shift-reduce parsing techniques.	5	Evaluating	Experiments 2-5, 11 (All parsing algorithms and implementations)
IT652PC.3	**Design** and **construct** compiler components for intermediate code generation and language translation systems.	6	Creating	Experiments 6, 12 (Quadruple generation, complete compiler design)

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	3	-	-	1	1	1	-	2	2	3	3	1
CO2	2	3	3	2	3	-	-	1	1	1	1	2	2	3	3	2
CO3	2	3	3	3	3	-	-	1	2	2	2	3	2	3	3	3
Average	**2**	**3**	**2.67**	**2.33**	**3**	**–**	**–**	**1**	**1.33**	**1.33**	**1**	**2.33**	**2**	**3**	**3**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-2, PSO-3** - Strong problem analysis, modern tool usage (LEX/YACC), software development skills, and mathematical foundations in compiler construction.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-1, PSO-4** - Engineering knowledge, design principles, investigation techniques, lifelong learning, and research applications.
Minor (1)	**PO8, PO9, PO10, PO11** - Basic ethics, teamwork, communication, and project management.
No Mapping	**PO6, PO7** - No direct societal or environmental focus.
Cognitive Range	**BTL 4-6** - Practical progression from implementation to design of compiler components.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT654PE: Python Programming Lab (Professional Elective II Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT654PE.1	**Implement** Python programs using fundamental concepts including data types, control structures, functions, and file operations.	3	Applying	Experiments 1-10, 12-13, 16-17 (Basic to intermediate programming concepts)
IT654PE.2	**Develop** object-oriented applications using classes, inheritance, modules, and exception handling mechanisms.	4	Analyzing	Experiments 11, 14-15, 18-20 (OOP concepts and advanced features)
IT654PE.3	**Design** and **integrate** practical Python applications solving real-world problems using comprehensive programming techniques.	6	Creating	All experiments with focus on project-based integration

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	1	3	-	-	1	1	1	-	2	2	3	2	1
CO2	2	3	3	2	3	-	-	1	1	1	1	2	2	3	2	2
CO3	2	3	3	2	3	-	-	1	2	2	2	3	2	3	2	3
Average	**2**	**3**	**2.67**	**1.67**	**3**	**–**	**–**	**1**	**1.33**	**1.33**	**1**	**2.33**	**2**	**3**	**2**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-2** - Strong problem-solving using Python, modern tool proficiency, and software development skills.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-1, PSO-3, PSO-4** - Engineering knowledge, design principles, investigation, lifelong learning, and mathematical applications.
Minor (1)	**PO8, PO9, PO10, PO11** - Basic ethics, teamwork, communication, and project management.
No Mapping	**PO6, PO7** - No direct societal or environmental focus.
Cognitive Range	**BTL 3-6** - Practical progression from basic implementation to designing integrated applications.

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MR21 – Revised Course Outcome
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MA654BS: Finishing School-IV (Quantitative Aptitude & Analytical Ability)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Module
MA654BS.1	**Apply** arithmetic operations, number systems, and algebraic concepts to solve quantitative problems efficiently.	3	Applying	Unit I – Quantitative Aptitude - Numerical Ability
MA654BS.2	**Analyze** business mathematics problems involving percentages, ratios, profit/loss, and interest calculations.	4	Analyzing	Unit II – Quantitative Aptitude - Arithmetic Ability-I
MA654BS.3	**Solve** problems related to time, work, speed, pipes, ages, and data interpretation using logical reasoning.	3	Applying	Unit III – Quantitative Aptitude - Arithmetic Ability-II
MA654BS.4	**Evaluate** coding patterns, series completion, and analytical reasoning problems using systematic approaches.	5	Evaluating	Unit IV – Reasoning Ability - General Reasoning-I
MA654BS.5	**Design** solutions for complex analogy, classification, and relational problems enhancing employability skills.	6	Creating	Unit V – Reasoning Ability - General Reasoning-II

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1	1	-	-	-	-	1	1	-	2	-	-	3	1
CO2	2	3	1	2	-	-	-	-	1	1	-	2	-	-	3	1
CO3	2	3	1	2	-	-	-	-	1	1	-	2	-	-	3	1
CO4	2	3	1	2	-	-	-	-	1	1	-	2	-	-	3	1
CO5	2	3	1	2	-	-	-	-	2	2	1	3	-	-	3	2
Average	**2**	**3**	**1**	**1.8**	**–**	**–**	**–**	**–**	**1.2**	**1.2**	**0.2**	**2.2**	**–**	**–**	**3**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PSO-3** - Strong problem-solving and analytical skills development through quantitative aptitude and logical reasoning exercises.
Moderate (2)	**PO1, PO4, PO9, PO10, PO12, PSO-4** - Mathematical knowledge application, investigation techniques, teamwork in collaborative learning, communication in problem explanation, lifelong learning, and competitive readiness.
Minor (1)	**PO3, PO11** - Limited design principles and basic project management in test strategies.
No Mapping	**PO5, PO6, PO7, PO8, PSO-1, PSO-2** - No tool usage, societal, environmental, ethical focus, or direct computer/software systems alignment.
Cognitive Range	**BTL 3-6** - Comprehensive progression from applying concepts to designing solutions for competitive exams.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

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MC601ESC: Environmental Science

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MC601ESC.1	**Explain** natural resources, their classification, conservation methods, and sustainable utilization practices.	2	Understanding	Unit I – Natural Resources
MC601ESC.2	**Analyze** ecosystem structures, biodiversity levels, and conservation strategies for ecological balance.	4	Analyzing	Unit II – Ecosystem and Biodiversity
MC601ESC.3	**Evaluate** various environmental pollution types, their impacts, and control measures for sustainable development.	5	Evaluating	Unit III – Environmental Pollution
MC601ESC.4	**Assess** global environmental issues and international efforts for climate change mitigation and protection.	5	Evaluating	Unit IV – Global Environmental Issues
MC601ESC.5	**Design** environmental management strategies following legal frameworks and sustainable development principles.	6	Creating	Unit V – Environmental Acts & Sustainable Development

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	1	-	2	3	2	-	1	-	2	-	-	1	1
CO2	1	2	1	2	-	2	3	2	-	1	-	2	-	-	1	1
CO3	1	2	2	2	-	3	3	2	-	2	-	2	-	-	2	2
CO4	1	2	1	2	-	3	3	2	-	2	-	2	-	-	1	2
CO5	1	2	2	2	-	3	3	3	1	2	2	3	-	-	2	3
Average	**1**	**2**	**1.4**	**1.8**	**–**	**2.6**	**3**	**2.2**	**0.2**	**1.6**	**0.4**	**2.2**	**–**	**–**	**1.4**	**1.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO7, PO6, PO8** - Strong environmental sustainability awareness, societal impact understanding, and ethical responsibility toward environmental protection.
Moderate (2)	**PO2, PO4, PO10, PO12, PSO-4** - Problem analysis, investigation techniques, communication, lifelong learning, and research applications in environmental science.
Minor (1)	**PO1, PO3, PO5, PO9, PO11, PSO-3** - Basic engineering relevance, design considerations, and mathematical applications.
No Mapping	**PSO-1, PSO-2** - No direct computer systems or software development focus.
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding environmental concepts to designing management strategies.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

MS705HS: Organizational Behaviour

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
MS705HS.1	**Explain** the fundamental concepts of organizational behavior and environmental factors influencing workplace behavior.	2	Understanding	Unit I – Introduction to OB
MS705HS.2	**Analyze** personality traits, perception processes, and learning theories affecting individual behavior in organizations.	4	Analyzing	Unit II – Personality, Perception & Learning
MS705HS.3	**Evaluate** motivation theories and leadership styles to enhance individual and team performance.	5	Evaluating	Unit III – Motivation & Leadership
MS705HS.4	**Apply** effective communication, decision-making, and conflict resolution techniques in organizational settings.	3	Applying	Unit IV – Communication & Conflict Management
MS705HS.5	**Design** strategies for organizational development, change management, and interpersonal effectiveness.	6	Creating	Unit V – Organizational Culture & Change Management

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	1	-	2	-	2	1	2	1	2	-	1	1	1
CO2	1	2	1	2	-	2	-	2	1	2	1	2	-	1	1	2
CO3	1	2	1	2	-	2	-	2	2	2	2	2	-	1	1	2
CO4	1	2	1	2	-	2	-	2	2	3	2	2	-	1	1	2
CO5	1	2	2	2	-	2	-	2	3	3	3	3	-	2	1	3
Average	**1**	**2**	**1.2**	**1.8**	**–**	**2**	**–**	**2**	**1.8**	**2.4**	**1.8**	**2.2**	**–**	**1.2**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10, PSO-4** - Strong communication skills through communication models and interpersonal techniques; research ability through case study analysis and organizational research methods.
Moderate (2)	**PO2, PO4, PO6, PO8, PO9, PO11, PO12** - Problem analysis in organizational challenges; investigation through research methods; societal impact awareness; ethical decision-making; teamwork in collaborative work; project management in organizational planning; lifelong learning in professional development.
Minor (1)	**PO1, PO3, PSO-2, PSO-3** - Basic engineering knowledge application; limited organizational system design; indirect software development principles; indirect mathematical applications.
No Mapping	**PO5, PO7, PSO-1** - No technical tools/software in behavioural science course; no environmental/sustainability; No direct computer systems focus content in syllabus.
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding concepts to designing organizational strategies.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

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IT701PC – Information Security

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT701PC.1	**Explain** security concepts, attacks, services, mechanisms, and classical encryption techniques.	2	Understanding	Unit I – Security Attacks & Classical Encryption
IT701PC.2	**Apply** modern encryption algorithms including DES, AES, and RSA for data protection.	3	Applying	Unit II – Conventional & Public Key Cryptography
IT701PC.3	**Analyze** authentication protocols, digital signatures, and key management techniques.	4	Analyzing	Unit III – Digital Signatures & Authentication
IT701PC.4	**Evaluate** email security protocols, IP security, and web security mechanisms.	5	Evaluating	Unit IV – Email, IP & Web Security
IT701PC.5	**Design** security solutions incorporating intrusion detection, viruses, and firewall technologies.	6	Creating	Unit V – Intruders, Viruses & Firewalls

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	1	-	2	-	1	-	2	2	1	2	1
CO2	2	3	2	2	2	1	-	2	-	1	-	2	2	2	3	1
CO3	2	3	2	2	2	1	-	2	-	1	-	2	2	2	3	2
CO4	2	3	2	2	2	1	-	2	-	2	1	2	2	2	3	2
CO5	2	3	3	2	2	2	-	3	1	2	2	3	2	3	2	3
Average	**2**	**2.8**	**2**	**1.8**	**1.8**	**1.2**	**–**	**2.2**	**0.2**	**1.4**	**0.6**	**2.2**	**2**	**2**	**2.6**	**1.8**

Justification

Strong (3)	**PO2, PSO-3** - Strong problem analysis in security threats and mathematical foundations in cryptographic algorithms.
Moderate (2)	**PO1, PO3, PO4, PO5, PO8, PO12, PSO-1, PSO-2, PSO-4** - Engineering knowledge, design principles, investigation, tool usage, ethics, lifelong learning, and research applications.
Minor (1)	**PO6, PO9, PO10, PO11** - Basic societal impact, teamwork, communication, and project management.
No Mapping	**PO7** - No environmental focus in information security syllabus.
Cognitive Range	**BTL 2-6** - Comprehensive progression from security concepts to designing security solutions.
Strong (3)	**PO2, PSO-3** - Strong problem analysis in security threats and mathematical foundations in cryptographic algorithms.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

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CS712PE: Full Stack Development (Professional Elective-III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS712PE.1	**Explain** full-stack architecture components and Node.js event-driven programming model.	2	**Understand**	Unit I
CS712PE.2	**Develop** server-side applications using Node.js modules for file handling and HTTP services.	3	**Apply**	Unit II
CS712PE.3	**Implement** database operations using MongoDB for data storage and retrieval in web applications.	3	**Apply**	Unit III
CS712PE.4	**Construct** web applications using Express framework and Angular components with proper routing.	3	**Apply**	Unit IV
CS712PE.5	**Design** interactive user interfaces using React components and state management techniques.	6	**Create**	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	1	-	-	-	-	-	-	1	2	3	1	2
CO2	3	3	2	2	3	-	-	-	-	-	-	1	2	3	1	2
CO3	3	3	2	2	3	-	-	-	-	-	-	1	2	3	2	2
CO4	3	3	3	2	3	-	-	-	-	-	-	1	2	3	1	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	3	1	3
Average	**3.0**	**2.8**	**2.2**	**2.0**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**1.2**	**2.0**	**3.0**	**1.2**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1, PO5** - Full-stack development knowledge and modern tool usage **PSO2** - Comprehensive software development skills
Moderate (2)	**PO2, PO3, PO4** - Problem analysis, design, and investigation in web development **PSO4** - Application development capability
Minor (1)	**PO12** - Continuous learning in evolving web technologies
No Mapping	**PO6, PO7, PO8, PO9, PO10, PO11, PSO1, PSO3** - Not directly addressed
Cognitive Range	**BTL 2-6** - Excellent alignment with target: L:20%, M:60%, H:20%

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B.Tech. VII Semester
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CS716PE: Cloud Computing (Professional Elective-IV)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS716PE.1	**Explain** the fundamental concepts, models, and architecture of cloud computing.	2	Understanding	Unit I – Cloud Computing Fundamentals
CS716PE.2	**Analyze** cloud deployment and service models to determine their suitability for different applications.	4	Analyzing	Unit II – Cloud Computing Architecture & Management
CS716PE.3	**Evaluate** different cloud deployment models (Public, Private, Hybrid) and service models (IaaS, PaaS, SaaS).	5	Evaluating	Unit III – Cloud Deployment & Service Models
CS716PE.4	**Apply** virtualization technologies to create and manage virtual machines and cloud resources.	3	Applying	Unit IV – Virtualization Technology
CS716PE.5	**Design** and **implement** cloud-based solutions using leading cloud service providers (AWS, Azure, Google Cloud).	6	Creating	Unit V – Cloud Service Providers & Applications

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	1	2	1	-	1	-	2	2	1	1	1
CO2	2	3	2	2	2	1	2	1	-	1	1	2	2	2	2	2
CO3	2	3	2	2	2	1	2	1	-	2	1	2	2	2	2	2
CO4	2	3	2	2	3	1	2	1	1	2	1	2	2	2	2	2
CO5	2	3	3	2	3	2	2	1	2	2	2	3	2	3	2	3
Average	**2**	**2.8**	**2**	**1.8**	**2.2**	**1.2**	**2**	**1**	**0.6**	**1.6**	**1**	**2.2**	**2**	**2**	**1.8**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-2** - Strong problem analysis in cloud scenarios, modern tool usage (AWS, Azure, virtualization), and software development for cloud platforms.
Moderate (2)	**PO1, PO3, PO4, PO7, PO12, PSO-1, PSO-4** - Engineering knowledge, design principles, investigation, environmental benefits of cloud, lifelong learning, and research in cloud technologies.
Minor (1)	**PO6, PO8, PO9, PO10, PO11, PSO-3** - Basic societal impact, ethics, teamwork, communication, project management, and mathematical concepts.
No Mapping	-
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding cloud concepts to designing cloud solutions.

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MR21 – Revised Course Outcome
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CE832OE: Remote Sensing and GIS (Open Elective III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CE832OE.1	**Explain** the principles of photogrammetry, aerial photography, and stereoscopy for spatial data acquisition.	2	Understanding	Unit I – Introduction to Photogrammetry
CE832OE.2	**Analyze** remote sensing processes, electromagnetic spectrum interactions, and spectral signatures for earth observation.	4	Analyzing	Unit II – Remote Sensing
CE832OE.3	**Apply** GIS components, coordinate systems, and map projections for geospatial data management.	3	Applying	Unit III – Geographic Information Systems
CE832OE.4	**Evaluate** vector data models, topology rules, and object-based data structures for spatial analysis.	5	Evaluating	Unit IV – Vector Data Model
CE832OE.5	**Design** integrated geospatial solutions using raster data models and data conversion techniques.	6	Creating	Unit V – Raster Data Model

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	1	2	1	-	1	-	2	2	1	1	1
CO2	2	3	2	2	2	1	2	1	-	1	1	2	2	2	2	2
CO3	2	3	2	2	2	1	2	1	-	2	1	2	2	2	2	2
CO4	2	3	2	2	3	1	2	1	1	2	1	2	2	2	2	2
CO5	2	3	3	2	3	2	2	1	2	2	2	3	2	3	2	3
Average	**2**	**2.8**	**2**	**1.8**	**2.2**	**1.2**	**2**	**1**	**0.6**	**1.6**	**1**	**2.2**	**2**	**2**	**1.8**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5** - Strong problem analysis in geospatial data interpretation and modern tool usage in remote sensing and GIS applications.
Moderate (2)	**PO1, PO3, PO4, PO6, PO7, PO12, PSO-3, PSO-4** - Engineering knowledge, design principles, investigation, societal applications, environmental monitoring, lifelong learning, and research in geospatial technologies.
Minor (1)	**PO8, PO9, PO10, PO11, PSO-1, PSO-2** - Basic ethics, teamwork, communication, project management, and software development applications.
No Mapping	-
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding geospatial concepts to designing integrated GIS solutions.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT751PC: Information Security Lab

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
IT751PC.1	**Implement** classical and modern encryption algorithms including DES, AES, RSA, and cryptographic hash functions.	4	Analyzing	Experiments 1-6, 10-11 (Encryption & Hashing)
IT751PC.2	**Develop** secure communication protocols and key exchange mechanisms using cryptographic techniques.	5	Evaluating	Experiments 7-9 (Key Exchange & Secure Protocols)
IT751PC.3	**Design** and **integrate** comprehensive security solutions combining multiple cryptographic algorithms and protocols.	6	Creating	All experiments with focus on integrated security systems

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	3	1	-	2	1	1	1	2	2	3	3	1
CO2	2	3	2	2	3	1	-	2	1	1	1	2	2	3	3	2
CO3	2	3	3	2	3	1	-	2	2	2	2	3	2	3	3	3
Average	**2**	**3**	**2.33**	**2**	**3**	**1**	**–**	**2**	**1.33**	**1.33**	**1.33**	**2.33**	**2**	**3**	**3**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-2, PSO-3** - Strong problem-solving in security scenarios, modern tool usage (cryptographic libraries), software development, and mathematical foundations in cryptography.
Moderate (2)	**PO1, PO3, PO4, PO8, PO12, PSO-1, PSO-4** - Engineering knowledge, design principles, investigation, ethics, lifelong learning, and research in security applications.
Minor (1)	**PO6, PO9, PO10, PO11** - Basic societal impact, teamwork, communication, and project management.
No Mapping	**PO7** - No environmental focus in security lab.
Cognitive Range	**BTL 4-6** - Practical progression from implementing algorithms to designing integrated security solutions.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

CS753PE: Full Stack Development Lab (Professional Elective-III Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
CS753PE.1	**Develop** server-side applications using Node.js with database connectivity and HTTP services.	4	Analyzing	Experiments 1-6, 13 (Node.js, MongoDB, HTTP Services)
CS753PE.2	**Design** interactive front-end applications using Angular and React with component-based architecture.	5	Evaluating	Experiments 9-12, 14-17 (Angular, React, UI Components)
CS753PE.3	**Create** and **deploy** full-stack web applications integrating front-end, back-end, and database components.	6	Creating	All experiments with focus on end-to-end application development

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	3	-	-	1	1	1	1	2	2	3	1	1
CO2	2	3	3	2	3	-	-	1	1	2	1	2	2	3	1	2
CO3	2	3	3	2	3	-	-	1	2	2	2	3	2	3	1	3
Average	**2**	**3**	**2.67**	**2**	**3**	**–**	**–**	**1**	**1.33**	**1.67**	**1.33**	**2.33**	**2**	**3**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO5, PSO-2** - Strong problem-solving in full stack scenarios, modern tool usage (Node.js, React, Angular, MongoDB), and software development skills.
Moderate (2)	**PO1, PO3, PO4, PO12, PSO-1, PSO-4** - Engineering knowledge, design principles, investigation, lifelong learning, and research in web technologies.
Minor (1)	**PO8, PO9, PO10, PO11, PSO-3** - Basic ethics, teamwork, communication, project management, and mathematical applications.
No Mapping	**PO6, PO7** - No societal or environmental focus in the lab syllabus.
Cognitive Range	**BTL 4-6** - Practical progression from developing components to creating full-stack applications.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT752PC: Industry Oriented Mini Project / Summer Internship

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Coverage Area
IT752PC.1	**Analyze** industry requirements and identify real-world problems to formulate precise project objectives and scope.	4	Analyzing	Problem Identification & Requirement Analysis
IT752PC.2	**Design** innovative IT solutions using appropriate architectures, technologies, and software engineering principles.	6	Creating	Solution Architecture & System Design
IT752PC.3	**Implement** and **test** the developed solution using modern tools and technologies following industry best practices.	5	Evaluating	Development & Quality Assurance
IT752PC.4	**Document** the project comprehensively including technical specifications, user manuals, and implementation guides.	3	Applying	Technical Documentation & Reporting
IT752PC.5	**Present** project outcomes effectively demonstrating professional communication, teamwork, and project management skills.	4	Analyzing	Professional Presentation & Viva Voce

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	2	1	2	2	2	2	2	2	3	2	3
CO2	3	3	3	2	3	2	1	2	3	2	3	3	3	3	2	3
CO3	3	3	3	2	3	2	1	2	2	2	3	3	3	3	2	3
CO4	2	2	2	2	2	1	1	2	1	3	2	2	2	2	2	2
CO5	2	2	2	2	1	2	1	2	3	3	2	3	2	2	1	3
Average	**2.4**	**2.6**	**2.4**	**2.2**	**2.2**	**1.8**	**1**	**2**	**2.2**	**2.4**	**2.4**	**2.6**	**2.4**	**2.6**	**1.8**	**2.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-4, PO12, PSO-2** - Strong research innovation, lifelong learning, and software development through industry project implementation.
Moderate (2)	**PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11, PSO-1** - Engineering knowledge, problem analysis, design, tools, ethics, teamwork, communication, project management, and computer systems.
Minor (1)	**PO6, PO7, PSO-3** - Basic societal, environmental, and mathematical considerations.
No Mapping	-
Cognitive Range	**BTL 3-6** - Comprehensive progression from application to creation and evaluation.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR21 Year/Sem: IV /I Department: IT

IT753PC: Seminar

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Coverage Area
IT753PC.1	**Identify** and formulate a contemporary technical topic in Information Technology through a comprehensive survey of literature and problem definition.	2	Understanding	Topic Selection & Literature Survey
IT753PC.2	**Analyze** and **synthesize** information from multiple technical sources to construct a logically structured and coherent seminar report.	4	Analyzing	Content Organization & Report Writing
IT753PC.3	**Design** and develop effective visual aids and presentation materials to clearly communicate complex technical concepts.	6	Creating	Presentation Preparation
IT753PC.4	**Demonstrate** effective oral communication skills by delivering a clear, confident, and well-paced technical presentation.	3	Applying	Presentation Delivery
IT753PC.5	**Defend** the seminar work by articulating and justifying ideas, conclusions, and methodologies during interactive questioning.	5	Evaluating	Viva-Voce / Q&A Session

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	2	-	2	-	-	-	1	1	1	-	3	-	1	-	1
CO2	-	2	-	2	-	-	-	2	1	2	-	2	-	2	1	2
CO3	-	-	2	-	2	-	-	1	1	2	-	1	-	3	-	2
CO4	-	-	-	-	-	-	-	2	2	**3**	-	2	-	1	-	**3**
CO5	-	1	-	-	-	-	-	2	2	**3**	-	2	-	1	1	**3**
Average	**–**	**1**	**0.4**	**0.8**	**0.4**	**–**	**–**	**1.6**	**1.4**	**2.2**	**–**	**2**	**–**	**1.6**	**0.4**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10 (Communication)** & **PSO-4 (Presentation & Technical Communication)** → The core of the seminar is effective oral and written technical communication, directly developing these outcomes.
Moderate (2)	**PO2 (Problem Analysis), PO4 (Investigation), PO12 (Life-long Learning), PSO-2 (Software Development)** → The process involves analyzing problems, investigating literature, independent learning, and structuring technical content, which aligns with these outcomes.
Minor (1)	**PO3 (Design), PO5 (Modern Tool Usage), PO8 (Ethics), PO9 (Teamwork), PSO-1 (Computer Systems), PSO-3 (Mathematical Concepts)** → Addressed indirectly through presentation design, use of software tools, ethical use of sources, peer learning, and applying foundational knowledge.
No Mapping	**PO1, PO6, PO7, PO11** → These outcomes related to core engineering knowledge, societal impact, sustainability, and project management are not the focus of this activity-based course.
Cognitive Range	**BTL 2–6 (Understanding → Evaluating)** – The seminar process spans the higher-order cognitive skills, from comprehending literature to creating and defending a presentation, which is ideal for a capstone-style activity.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT754PC: Project Stage I

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Unit
IT754PC.1	Define the project problem, objectives, and literature background relevant to the domain.	2	Understanding	Project Scoping & Literature Review
IT754PC.2	Apply engineering and analytical skills to design the architecture and methodology for the proposed system.	3	Applying	System Design & Methodology
IT754PC.3	Develop partial prototypes or modules demonstrating feasibility and functionality.	6	Creating	Prototype Development
IT754PC.4	Evaluate design alternatives, tools, and methodologies to justify technical decisions.	5	Evaluating	Critical Analysis & Justification
IT754PC.5	Document and present project progress, adhering to ethical and professional standards.	3	Applying	Documentation & Communication

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	**3**	1	**3**	1	1	1	1	1	1	-	**3**	1	1	1	1
CO2	2	2	**3**	2	2	1	1	1	2	2	1	2	2	**3**	2	2
CO3	2	2	**3**	2	**3**	1	1	1	2	2	1	2	2	**3**	2	2
CO4	2	**3**	2	**3**	2	1	1	2	1	2	1	2	1	2	2	2
CO5	-	-	-	-	1	1	-	**3**	**3**	**3**	2	2	-	2	-	**3**
Average	**1.4**	**2**	**1.8**	**2**	**1.8**	**1**	**0.8**	**1.6**	**1.8**	**2**	**1**	**2.2**	**1.2**	**2.2**	**1.4**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis)** and **PO4 (Investigation)** are strongly addressed through problem definition and literature survey (CO1). **PO3 (Design)** is strongly met by designing the system architecture (CO2, CO3). **PO12 (Life-long Learning)** is core to the self-driven research in a project. **PSO-2 (Software Development)** is the primary focus of the project's design and development phases.
Moderate (2)	**PO1 (Engineering Knowledge), PO5 (Modern Tools), PO9 (Teamwork), PO10 (Communication), PSO-1 (Computer Systems), PSO-3 (Mathematical Concepts), PSO-4 (Research)** are consistently applied throughout the project lifecycle, from using knowledge and tools to collaborative work and reporting.
Minor (1)	**PO6 (The Engineer and Society), PO7 (Environment), PO8 (Ethics), PO11 (Project Management)** are not the central focus but are introduced. Societal and environmental impact (PO6, PO7) might be considered. Ethics (PO8) are covered in documentation. Basic project management (PO11) is involved in planning.
No Mapping	-
Cognitive Range	**BTL 2–6 (Understanding → Creating)** – The project work effectively spans the higher-order cognitive skills, from comprehending the problem domain to creating a prototype and evaluating design choices, which is ideal for a capstone project stage.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester
Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

IT801PC: Data Mining
Course Outcomes
After successful completion of this course, the students will be able to:

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT801PC.1	**Analyze** the challenges in data preprocessing and **apply** techniques like data cleaning, transformation, and reduction to prepare raw data for mining.	4	Analyzing	Unit-I: Introduction & Data Preprocessing
IT801PC.2	**Implement** association rule mining algorithms such as Apriori and FP-Growth to discover interesting patterns and relationships in transactional datasets.	3	Applying	Unit-II: Association Rules
IT801PC.3	**Evaluate** and **select** appropriate classification algorithms, including Decision Trees and Naive Bayes, to build accurate predictive models for a given problem.	5	Evaluating	Unit-III: Classification
IT801PC.4	**Design** clustering solutions using partitioning (e.g., K-Means) and hierarchical methods to segment unlabeled data and **interpret** the formed clusters.	6	Creating	Unit-IV: Clustering
IT801PC.5	**Propose** data mining solutions for web-based applications and **analyze** the associated ethical, privacy, and social implications.	6	Creating	Unit-V: Web Mining & Applications

Course Articulation Matrix

CO / PO / PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	-	2	2	-	-	-	-	-	-	1	1	1	**3**	1
CO2	2	2	2	2	2	-	-	-	-	-	-	1	1	2	**3**	1
CO3	2	**3**	2	2	2	-	-	-	-	-	-	1	1	2	**3**	1
CO4	2	**3**	2	**3**	2	-	-	-	-	-	-	1	1	2	**3**	1
CO5	1	2	**3**	2	2	2	1	2	-	2	-	2	1	**3**	2	**3**
Average	**1.8**	**2.4**	**1.8**	**2.2**	**2**	**0.4**	**0.2**	**0.4**	**–**	**0.4**	**–**	**1.2**	**1**	**2**	**2.8**	**1.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Foundation of mathematical concepts)** is the core of this course, as all data mining algorithms are fundamentally based on statistical, probabilistic, and linear algebraic concepts (CO1-CO5). **PO2 (Problem analysis)** is strongly addressed in selecting and evaluating the correct mining algorithms for different data problems (CO3, CO4).
Moderate (2)	**PO1 (Engineering knowledge), PO3 (Design solutions), PO4 (Investigations), PO5 (Modern tool usage), PO10 (Communication), PSO-2 (Software development)** are consistently applied. Students use engineering principles to design data solutions, investigate patterns, use tools, and document findings.
Minor (1)	**PO6 (The engineer and society), PO7 (Environment), PO8 (Ethics), PO12 (Life-long learning), PSO-1 (Computer systems), PSO-4 (Research)** are partially met. Ethics and societal impact are discussed regarding data privacy (CO5). The evolving nature of the field encourages lifelong learning.
No Mapping	**PO9 (Individual and team work)** and **PO11 (Project management and finance)** are not directly addressed by the theoretical and algorithmic focus of the course outcomes.
Cognitive Range	**BTL 3–6 (Applying → Creating)** – The course strongly emphasizes higher-order cognitive skills, moving beyond understanding to applying algorithms, evaluating models, and designing new solutions, which is ideal for an advanced technical course.

MR21 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

CS814PE: Adhoc & Sensor Networks (Professional Elective V)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS814PE.1	**Explain** the fundamental characteristics, applications, and challenges of Mobile Ad hoc Networks (MANETs) and Wireless Sensor Networks (WSNs).	2	Understanding	Unit-I: Introduction to Ad Hoc Networks
CS814PE.2	**Compare** and **contrast** different routing protocols (DSDV, DSR, AODV, ZRP) and analyze their suitability for various MANET scenarios.	4	Analyzing	Unit-II: Routing in MANETs
CS814PE.3	**Design** efficient data transmission strategies for MANETs, including solutions for broadcast storms and multicasting.	6	Creating	Unit-III: Data Transmission
CS814PE.4	**Analyze** the architectural components and protocol stack of Wireless Sensor Networks and **evaluate** their role in system design.	4	Analyzing	Unit-IV: Basics of WSNs
CS814PE.5	**Evaluate** transport layer and application layer protocols for WSNs and **propose** adaptations for dynamic network conditions.	5	Evaluating	Unit-V: Upper Layer Issues of WSN

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	1	1	-	-	1	-	1	2	1	1	1
CO2	2	3	2	2	2	1	1	-	-	1	-	1	2	2	2	1
CO3	2	2	3	2	2	1	1	-	1	1	1	1	2	3	2	2
CO4	2	3	2	3	2	1	1	-	-	1	-	1	3	2	2	2
CO5	2	3	3	3	2	2	2	1	1	2	1	2	2	3	2	3
Average	**2**	**2.6**	**2.2**	**2.2**	**1.8**	**1.2**	**1.2**	**0.2**	**0.4**	**1.2**	**0.4**	**1.2**	**2.2**	**2.2**	**1.8**	**1.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem analysis)** is strongly addressed through the analysis and comparison of routing protocols and network strategies (CO2, CO4, CO5). **PSO-1 (Computer Systems)** and **PSO-2 (Software Development)** are core to understanding and designing network architectures and protocols (CO3, CO4, CO5).
Moderate (2)	**PO1 (Engineering knowledge), PO3 (Design solutions), PO4 (Investigations), PO5 (Modern tool usage)** are consistently applied in understanding network fundamentals, designing transmission strategies, and analyzing protocols.
Minor (1)	**PO6 (Society), PO7 (Environment), PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO11 (Project management), PO12 (Life-long learning), PSO-3 (Mathematical concepts), PSO-4 (Research)** are partially met. Societal impact is considered in applications. The evolving nature of the field encourages lifelong learning.
No Mapping	-
Cognitive Range	**BTL 2–6 (Understanding → Creating)** – The course covers a wide range of cognitive skills, from explaining basic concepts to designing network strategies and evaluating protocols, which is essential for mastering ad hoc and sensor networks.

MR21 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

IT814PE: Human Computer Interaction (Professional Elective VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT814PE.1	**Explain** the importance of user interface design and **compare** the characteristics of graphical and web user interfaces.	2	Understanding	Unit I: Importance of User Interface
IT814PE.2	**Apply** user-centered design principles and human factors to **design** effective screen layouts and navigation schemes.	3	Applying	Unit II: User Interface Design Process
IT814PE.3	**Design** and **evaluate** interactive systems by selecting appropriate menus, windows, controls, and visual elements.	6	Creating	Unit III: Interface Components Design
IT814PE.4	**Analyze** usability requirements and **apply** evaluation techniques to assess interface effectiveness.	4	Analyzing	Unit IV: HCI in Software Process
IT814PE.5	**Create** innovative interface solutions using cognitive models and emerging technologies like ubiquitous computing.	6	Creating	Unit V: Cognitive Models & Future Trends

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	-	1	-	1	-	2	-	1	1	1	1	1
CO2	1	2	**3**	2	1	2	-	2	1	2	-	1	1	**3**	1	2
CO3	1	2	**3**	2	1	2	-	2	1	2	-	1	1	**3**	1	2
CO4	1	2	2	**3**	1	2	-	2	1	2	-	1	1	2	1	2
CO5	1	2	**3**	2	1	2	-	2	1	2	-	2	1	**3**	1	**3**
Average	**1**	**1.8**	**2.4**	**2**	**0.8**	**1.8**	**–**	**1.8**	**0.8**	**2**	**–**	**1.2**	**1**	**2.4**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO3 (Design/development of solutions)** and **PSO-2 (Foundations of Software development)** are strongly addressed as the core of HCI involves designing user-centered solutions and interfaces (CO2, CO3, CO5).
Moderate (2)	**PO2 (Problem analysis), PO4 (Investigations), PO6 (Society), PO8 (Ethics), PO10 (Communication), PSO-4 (Research)** are addressed through analyzing user needs, usability testing, considering societal impact, ethical design, and technical communication.
Minor (1)	**PO1 (Engineering knowledge), PO5 (Modern tools), PO9 (Teamwork), PO12 (Life-long learning), PSO-1 (Computer systems), PSO-3 (Mathematical concepts)** have limited connection to this theory-oriented HCI course.
No Mapping	**PO7 (Environment)** - Environmental sustainability is not addressed in the syllabus. **PO11 (Project management)** - Not covered in the theoretical curriculum.
Cognitive Range	**BTL 2 → 5** — progresses from understanding human interaction models to designing and evaluating user-centric interfaces through creative and analytical processes.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

IT851PC – Project Stage II (Major Project)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain (Keyword)	Linked Phase
IT851PC.1	**Explain** the finalized project objectives, design approach, and expected outcomes.	2	Understanding	Project Planning & Design
IT851PC.2	**Implement** complete system modules integrating hardware/software components effectively.	3	Applying	System Development & Integration
IT851PC.3	**Analyze** experimental results and validate system performance against defined metrics.	4	Analyzing	Testing & Validation
IT851PC.4	**Evaluate** project results for efficiency, scalability, and compliance with professional ethics and sustainability.	5	Evaluating	Performance & Ethics Analysis
IT851PC.5	**Present** and **defend** the completed project work effectively through technical reports, viva, and demonstrations.	3	Applying	Documentation & Communication

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	1	1	1	1	1	2	1	2	2	2	2	2
CO2	2	2	**3**	2	**3**	1	1	1	2	2	2	2	**3**	**3**	2	2
CO3	2	**3**	2	**3**	2	1	1	1	1	2	1	2	2	2	**3**	2
CO4	2	2	2	2	2	2	2	**3**	1	2	2	2	2	2	2	2
CO5	1	1	1	1	1	1	1	2	2	**3**	2	2	1	1	1	**3**
Average	**1.8**	**2**	**2**	**2**	**1.8**	**1.2**	**1.2**	**1.6**	**1.4**	**2.2**	**1.6**	**2**	**2**	**2**	**2**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO10 (Communication)** is strongly addressed through comprehensive project documentation and defense (CO5). **PO3 (Design solutions)** and **PSO-1 (Computer Systems)** are met through system implementation and integration (CO2). **PO5 (Modern tool usage)** is addressed through hardware/software implementation (CO2).
Moderate (2)	**PO1 (Engineering knowledge), PO2 (Problem analysis), PO4 (Investigations), PO8 (Ethics), PO11 (Project management), PO12 (Life-long learning), PSO-2 (Software development), PSO-3 (Mathematical concepts), PSO-4 (Research)** are consistently applied throughout the project lifecycle.
Minor (1)	**PO6 (Society), PO7 (Environment), PO9 (Teamwork)** are partially addressed through ethical considerations and collaborative work, though not explicitly emphasized in the COs.
No Mapping	All POs and PSOs show at least some correlation with the course outcomes.
Cognitive Range	**BTL 2–5 (Understanding → Evaluating)** – The project work spans multiple cognitive levels, from explaining designs to evaluating outcomes, demonstrating comprehensive learning.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT521OE: Biometrics (Open Elective-I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT521OE.1	**Explain** the fundamental concepts, architecture, and applications of biometric systems.	2	Understanding	Unit I
IT521OE.2	**Analyze** various physiological and behavioral biometric traits for identification and authentication.	4	Analyzing	Unit II
IT521OE.3	**Apply** feature extraction and pattern matching techniques for biometric verification and recognition.	3	Applying	Unit III
IT521OE.4	**Evaluate** biometric system performance using metrics such as FAR, FRR, and ROC curves.	5	Evaluating	Unit IV
IT521OE.5	**Assess** ethical, privacy, and security issues in biometric applications and **propose** mitigation strategies.	5	Evaluating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	-	1	-	1	-	1	-	2	2	1	2	1
CO2	2	3	2	1	-	-	-	1	-	-	-	2	2	2	2	1
CO3	2	3	2	1	1	-	-	1	-	-	-	2	2	2	2	1
CO4	2	3	2	2	1	-	-	1	-	-	-	2	2	2	2	1
CO5	1	2	1	2	-	2	1	3	1	2	1	2	1	1	1	2
Average	**2.8**	**2.8**	**1.8**	**1.4**	**0.4**	**-**	**-**	**0.2**	**0.2**	**0.6**	**0.2**	**2**	**2.8**	**1.8**	**2**	**1**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2** - Strong problem analysis in biometric trait evaluation and system performance assessment.
Moderate (2)	**PO1, PO3, PO4, PO8, PO12, PSO-3** - Engineering knowledge, design principles, investigation, ethics, and mathematical foundations.
Minor (1)	**PO5, PO6, PO7, PO9, PO10, PO11, PSO-1, PSO-2, PSO-4** - Tool usage, societal impact, teamwork, communication, and research context.
No Mapping	-
Cognitive Range	**BTL 2-5** - Appropriate progression from understanding concepts to evaluating systems and ethical implications.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT522OE: Cyber Forensics (Open Elective-I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT522OE.1	**Explain** the fundamentals of cybercrimes, attack types, and the role of cyber forensics in investigation.	2	Understanding	Unit I – Introduction to Cybercrime & Forensics
IT522OE.2	**Analyze** digital evidence collection methods, investigation procedures, and chain of custody principles.	4	Analyzing	Unit II – Digital Evidence & Investigation Procedures
IT522OE.3	**Apply** forensics techniques and tools to examine file systems, network logs, and memory artifacts.	3	Applying	Unit III – Data Recovery & Network Forensics
IT522OE.4	**Evaluate** legal frameworks, cyber laws, and international standards relevant to cyber investigations.	5	Evaluating	Unit IV – Cyber Laws & Ethics
IT522OE.5	**Design** investigative approaches for real-world case studies and **recommend** preventive cyber strategies.	6	Creating	Unit V – Case Studies & Cybersecurity Strategies

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	-	-	2	-	2	-	1	-	2	2	1	1	1
CO2	2	3	2	2	1	2	-	2	-	1	-	2	2	2	1	2
CO3	2	3	2	2	2	1	-	2	1	1	-	2	2	2	1	2
CO4	1	2	1	2	-	2	-	3	-	2	1	2	1	1	1	2
CO5	2	3	3	3	2	3	1	3	2	2	2	3	2	2	1	3
Average	**1.8**	**2.6**	**1.8**	**1.8**	**1**	**2**	**0.2**	**2.4**	**0.6**	**1.4**	**0.6**	**2.2**	**1.8**	**1.6**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PO8, PSO-4** - Strong problem analysis in cyber investigations, ethical/legal compliance, and research in cybersecurity.
Moderate (2)	**PO4, PO6, PO12, PSO-1** - Investigation methodologies, societal impact, lifelong learning, and computer systems understanding.
Minor (1)	**PO1, PO3, PO5, PO7, PO9, PO10, PO11, PSO-2, PSO-3** - Basic engineering knowledge, tool usage, teamwork, and mathematical concepts.
No Mapping	-
Cognitive Range	**BTL 2-6** - Comprehensive progression from understanding to creating investigative strategies.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

CS521OE: Data Structures (Open Elective - I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS521OE.1	**Explain** the fundamental concepts of data organization, abstract data types, and basic operations on arrays and linked lists.	2	Understanding	Unit I – Introduction to Data Structures
CS521OE.2	**Apply** stack and queue data structures to **solve** problems involving recursion, expression evaluation, and scheduling.	3	Applying	Unit II – Stacks & Queues
CS521OE.3	**Analyze** linked lists, trees, and graphs to **represent** hierarchical and network data structures.	4	Analyzing	Unit III – Linked Lists, Trees & Graphs
CS521OE.4	**Implement** sorting and searching algorithms to **evaluate** time and space efficiency.	5	Evaluating	Unit IV – Searching & Sorting Techniques
CS521OE.5	**Design** solutions for real-world problems using appropriate data structures and **compare** their performance.	5	Evaluating	Unit V – Case Studies & Applications

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1	-	-	-	-	-	1	-	1	1	1	2	1
CO2	2	2	2	1	1	-	-	-	-	1	-	1	1	2	3	1
CO3	2	3	2	2	1	-	-	-	-	1	-	1	2	2	3	1
CO4	2	3	2	2	1	-	-	-	-	1	-	1	1	2	3	1
CO5	2	3	3	2	2	1	-	-	1	2	-	2	2	3	3	2
Average	**2**	**2.4**	**2**	**1.6**	**1**	**0.2**	**–**	**–**	**0.2**	**1.2**	**–**	**1.2**	**1.4**	**2**	**2.8**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Foundation of mathematical concepts)** is strongly addressed as data structures fundamentally rely on mathematical modeling and algorithm analysis (CO2-CO5). **PO2 (Problem analysis)** is key in analyzing and selecting appropriate data structures for problem-solving (CO3-CO5).
Moderate (2)	**PO1 (Engineering knowledge), PO3 (Design solutions), PSO-2 (Software development)** are consistently applied through understanding data organization principles and designing efficient solutions.
Minor (1)	**PO4 (Investigations), PO5 (Modern tools), PO6 (Society), PO10 (Communication), PO12 (Life-long learning), PSO-1 (Computer systems), PSO-4 (Research)** are partially addressed through basic investigations, tool usage, and communication of solutions.
No Mapping	**PO7 (Environment), PO8 (Ethics), PO9 (Teamwork), PO11 (Project management)** are not directly addressed in this fundamental course focused on individual data structure concepts.
Cognitive Range	**BTL 2–5 (Understanding → Evaluating)** – The course effectively progresses from understanding basic concepts to evaluating algorithm efficiency and designing solutions, covering essential cognitive levels for data structures.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT621OE: Human Computer Interaction (Open Elective II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT621OE.1	**Explain** the importance of user interface design and **compare** different types of user interfaces.	2	Understanding	Unit I: Importance of User Interface
IT621OE.2	**Apply** human factors and design principles to **create** effective screen layouts and navigation schemes.	3	Applying	Unit II: User Interface Design Process
IT621OE.3	**Design** interactive systems by selecting appropriate menus, windows, controls, and visual elements.	6	Creating	Unit III: Interface Components
IT621OE.4	**Evaluate** interface usability through various evaluation techniques and heuristic principles.	5	Evaluating	Unit IV: HCI in Software Process
IT621OE.5	**Develop** innovative interface solutions using cognitive models and emerging interaction technologies.	6	Creating	Unit V: Cognitive Models & Future Trends

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	-	1	-	1	-	2	-	1	1	1	1	1
CO2	1	2	2	2	1	2	-	1	1	2	-	1	1	2	1	2
CO3	1	2	3	2	1	2	-	1	1	2	-	1	1	3	1	2
CO4	1	2	2	3	1	2	-	2	1	2	-	1	1	2	1	2
CO5	1	2	3	2	2	2	1	2	1	2	-	2	1	3	1	3
Average	**1**	**1.8**	**2.2**	**2**	**1**	**1.8**	**0.2**	**1.4**	**0.8**	**2**	**–**	**1.2**	**1**	**2.2**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO3 (Design/development of solutions)** and **PSO-2 (Foundations of Software development)** are strongly addressed through designing and developing user-centered interface solutions (CO3, CO5).
Moderate (2)	**PO2 (Problem analysis), PO4 (Investigations), PO6 (Society), PO10 (Communication), PSO-4 (Research)** are consistently applied in analyzing user needs, evaluating interfaces, considering societal impact, and communicating design solutions.
Minor (1)	**PO1 (Engineering knowledge), PO5 (Modern tools), PO7 (Environment), PO8 (Ethics), PO9 (Teamwork), PO12 (Life-long learning), PSO-1 (Computer systems), PSO-3 (Mathematical concepts)** are partially met through basic principles and individual design activities.
No Mapping	**PO11 (Project management)** is not addressed in this theoretical HCI course focused on design principles and evaluation.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** – The course effectively progresses from understanding basic concepts to creating innovative interface solutions, covering the full spectrum of cognitive skills needed for HCI design.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

CS621OE: Computer Networks (Open Elective-II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS621OE.1	**Explain** network architectures, reference models, and transmission media fundamentals.	2	Understanding	Unit I: Network Fundamentals & Physical Layer
CS621OE.2	**Apply** error detection/correction techniques and data link protocols for reliable communication.	3	Applying	Unit II: Data Link Layer & MAC Sub-layer
CS621OE.3	**Analyze** routing algorithms and congestion control mechanisms in network layer.	4	Analyzing	Unit III: Network Layer & Routing
CS621OE.4	**Compare** transport layer protocols and their connection management strategies.	4	Analyzing	Unit IV: Transport Layer
CS621OE.5	**Implement** application layer protocols for domain resolution, email, and web services.	3	Applying	Unit V: Application Layer

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1	1	1	-	-	-	1	-	1	2	1	1	1
CO2	2	2	2	2	1	1	-	-	-	1	-	1	2	2	2	1
CO3	2	3	2	2	1	1	-	-	-	1	-	1	2	2	3	1
CO4	2	2	2	2	1	1	-	-	-	1	-	1	2	2	2	1
CO5	2	2	2	2	2	2	-	-	-	2	-	1	2	3	2	2
Average	**2**	**2**	**1.8**	**1.8**	**1.2**	**1.2**	**–**	**–**	**–**	**1.2**	**–**	**1**	**2**	**2**	**2**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PSO-1 (Computer Systems)** - Core networking concepts, protocol analysis, and system architecture directly address these outcomes through network design and problem-solving.
Moderate (2)	**PO3 (Design Solutions), PO4 (Investigations), PSO-2 (Software Development), PSO-3 (Mathematical Concepts)** - Protocol implementation, network investigations, and algorithmic thinking moderately support these outcomes.
Minor (1)	**PO5 (Modern Tools), PO6 (Society), PO10 (Communication), PO12 (Life-long Learning)** - Basic tool usage, societal impact of networks, and communication of technical concepts are partially addressed.
No Mapping	**PO7 (Environment), PO8 (Ethics), PO9 (Teamwork), PO11 (Project Management)** - Environmental aspects, ethical considerations, teamwork, and project management are not covered in this technical networking course.
Cognitive Range	**BTL 2–4 (Understanding → Analyzing)** - The course progresses from understanding fundamentals to analyzing protocols and algorithms, suitable for an introductory networks course.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

CS623OE: Java Programming (Open Elective-II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS623OE.1	**Apply** object-oriented programming principles using Java classes, objects, and inheritance.	3	Applying	Unit I: OOP & Inheritance
CS623OE.2	**Implement** packages, interfaces, and exception handling mechanisms in Java applications.	3	Applying	Unit II: Packages, Interfaces & Exceptions
CS623OE.3	**Develop** multithreaded applications with synchronization and inter-thread communication.	6	Creating	Unit III: Multithreading & I/O
CS623OE.4	**Utilize** Java collection framework and utility classes for data manipulation tasks.	3	Applying	Unit IV: Collections Framework
CS623OE.5	**Design** GUI applications using Swing components and event handling mechanisms.	6	Creating	Unit V: GUI Programming

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	2	-	-	1	-	1	-	1	1	2	1	1
CO2	2	2	2	1	2	-	-	2	-	1	-	1	1	2	1	1
CO3	2	2	2	1	2	-	-	1	-	1	-	1	1	3	1	1
CO4	2	2	2	1	2	-	-	1	-	1	-	1	1	3	1	1
CO5	2	2	3	2	2	1	-	1	-	2	-	1	1	3	1	2
Average	**2**	**2**	**2.2**	**1.2**	**2**	**0.2**	**–**	**1.2**	**–**	**1.2**	**–**	**1**	**1**	**2.6**	**1**	**1.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - All course outcomes strongly contribute to software development foundations through practical Java programming, OOP implementation, and application development.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO5 (Modern Tools)** - Programming concepts, problem-solving, application design, and development tools are consistently applied across all course outcomes.
Minor (1)	**PO4 (Investigations), PO6 (Society), PO8 (Ethics), PO10 (Communication), PO12 (Life-long Learning)** - Basic debugging, societal impact considerations, ethical coding practices, documentation, and continuous learning are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems), PSO-4 (Research)** - Environmental aspects, collaborative work, project management, hardware focus, and research methodology are not emphasized in this programming-focused course.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - The course emphasizes practical application of programming concepts and creation of software solutions, progressing from basic implementation to advanced application development.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester
Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

IT721OE: Computer Graphics (Open Elective III)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT721OE.1	**Explain** computer graphics systems, display devices, and output primitives including line and circle drawing algorithms.	2	Understanding	Unit I
IT721OE.2	**Apply** 2D geometric transformations and implement clipping algorithms for graphical applications.	3	Applying	Unit II
IT721OE.3	**Analyze** 3D object representations, transformations, and viewing pipeline for three-dimensional graphics.	4	Analyzing	Unit III
IT721OE.4	**Evaluate** visible surface detection methods and illumination models for realistic rendering.	5	Evaluating	Unit IV
IT721OE.5	**Design** computer animation sequences and implement basic animation functions.	6	Creating	Unit V

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	1	-	-	1	-	1	-	2	2	1	2	1
CO2	2	3	2	2	2	-	-	1	1	1	1	2	2	2	3	1
CO3	2	3	2	2	2	-	-	1	1	1	1	2	2	2	3	2
CO4	2	3	2	2	2	-	-	1	1	2	1	2	2	2	3	2
CO5	2	3	3	2	3	-	-	1	2	2	2	3	2	3	2	3
Average	**2.0**	**2.8**	**2.0**	**1.8**	**2.0**	**–**	**–**	**1.0**	**1.0**	**1.4**	**1.0**	**2.2**	**2.0**	**2.0**	**2.6**	**1.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2, PSO3:** Strong **problem analysis** in graphical algorithms and **mathematical foundations** in transformations and rendering.
Moderate (2)	**PO1, PO3, PO4, PO5, PO12, PSO1, PSO2, PSO4:** Application of **engineering knowledge**, **design** of graphical systems, **investigation** of algorithms, use of **modern tools**, **lifelong learning**, understanding of **computer systems**, **software development** for graphics, and **research** in visualization.
Minor (1)	**PO8, PO9, PO10, PO11:** Basic **ethical** considerations, **teamwork**, **communication**, and **project management**.
No Mapping	**PO6, PO7:** No societal or environmental context.
Cognitive Range	**BTL 2 → 6:** Comprehensive progression from understanding graphics concepts to designing animation sequences.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester

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CS721OE: Python Programming (Open Elective III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS721OE.1	**Apply** Python programming fundamentals including data types, control structures, and functions to solve basic computational problems.	3	Applying	Unit I: Python Basics & Control Structures
CS721OE.2	**Implement** Python sequences (strings, lists, tuples), dictionaries, and sets for efficient data organization and manipulation.	3	Applying	Unit II: Sequences & Data Structures
CS721OE.3	**Develop** Python applications using exception handling, modules, and file operations for robust program design.	6	Creating	Unit III: Errors, Functions & File Operations
CS721OE.4	**Design** object-oriented programs using classes, inheritance, and polymorphism in Python.	6	Creating	Unit IV: OOP & File Operations
CS721OE.5	**Create** GUI applications using Tkinter and other Python libraries for interactive software solutions.	6	Creating	Unit V: GUI Programming

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	2	-	-	1	-	1	-	1	1	2	1	1
CO2	2	2	2	1	2	-	-	1	-	1	-	1	1	2	2	1
CO3	2	2	2	2	2	-	-	2	-	2	-	2	1	3	1	2
CO4	2	2	3	2	2	-	-	1	-	2	-	2	1	3	1	2
CO5	2	2	3	2	2	1	-	1	-	2	-	2	1	3	1	3
Average	**2**	**2**	**2.4**	**1.6**	**2**	**0.2**	**–**	**1.2**	**–**	**1.6**	**–**	**1.6**	**1**	**2.6**	**1.2**	**1.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - All course outcomes strongly contribute through practical Python programming, OOP implementation, and application development. **PO3 (Design Solutions)** - Strongly addressed through object-oriented design and GUI application development.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO5 (Modern Tools), PO12 (Life-long Learning)** - Programming concepts, computational problem-solving, Python tools usage, and continuous skill development are consistently applied.
Minor (1)	**PO4 (Investigations), PO8 (Ethics), PO10 (Communication), PSO-3 (Mathematical Concepts), PSO-4 (Research)** - Basic debugging, ethical coding, documentation, algorithmic thinking, and exploratory programming are partially addressed.
No Mapping	**PO6 (Society), PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems)** - Societal impact, environmental aspects, collaborative work, project management, and hardware focus are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - The course emphasizes practical application and creation of software solutions, progressing from basic programming to advanced application development.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

CS723OE: Introduction to Machine Learning (Open Elective-III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS723OE.1	**Explain** fundamental concepts of machine learning, concept learning, and decision tree representation with appropriate problem identification.	2	Understanding	Unit I: Introduction & Concept Learning
CS723OE.2	**Apply** artificial neural networks including perceptrons and backpropagation algorithms for pattern recognition tasks.	3	Applying	Unit II: Artificial Neural Networks
CS723OE.3	**Analyze** Bayesian learning methods, computational learning theory, and instance-based learning algorithms.	4	Analyzing	Unit III: Bayesian & Instance-based Learning
CS723OE.4	**Evaluate** genetic algorithms, rule-based learning systems, and reinforcement learning techniques for different problem domains.	5	Evaluating	Unit IV: Genetic Algorithms & Rule Learning
CS723OE.5	**Design** analytical learning solutions by combining inductive and analytical approaches using prior knowledge.	6	Creating	Unit V: Analytical Learning

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	-	-	-	-	1	-	2	1	1	2	1
CO2	2	2	2	2	2	-	-	-	-	1	-	2	1	2	3	2
CO3	2	3	2	3	2	-	-	-	-	2	-	2	1	2	3	2
CO4	2	3	2	3	2	1	-	1	-	2	-	2	1	2	3	2
CO5	2	3	3	3	2	1	-	1	-	2	-	3	1	3	3	3
Average	**2**	**2.6**	**2**	**2.6**	**1.8**	**0.4**	**–**	**0.4**	**–**	**1.6**	**–**	**2.2**	**1**	**2**	**2.8**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Mathematical Concepts)** - Strongly addressed through statistical learning, probability theory, and algorithmic mathematics in ML. **PO2 (Problem Analysis)** - Key in analyzing learning problems and algorithm selection. **PO4 (Investigations)** - Essential for experimental analysis and model evaluation.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO5 (Modern Tools), PO12 (Life-long Learning), PSO-2 (Software Development), PSO-4 (Research)** - ML principles, algorithm design, tool usage, continuous learning, and research methodology are consistently applied.
Minor (1)	**PO6 (Society), PO8 (Ethics), PO10 (Communication)** - Basic societal impact, ethical considerations in AI, and technical communication are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems)** - Environmental aspects, collaborative work, project management, and hardware focus are not emphasized.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from fundamental concepts to designing ML solutions, covering all cognitive levels essential for machine learning.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT611PE: Biometrics (Professional Elective – I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT611PE.1	**Explain** the fundamental concepts, architecture, and types of biometric systems along with performance measures and applications.	2	Understanding	Unit I: Introduction & Handwritten Character Recognition
IT611PE.2	**Analyze** various biometric technologies including face, retina, iris, vein, and fingerprint recognition systems and their working principles.	4	Analyzing	Unit II: Face, Retina & Iris Biometrics
IT611PE.3	**Evaluate** privacy concerns in biometric systems and apply cryptographic techniques for enhancing security in multimodal biometrics.	5	Evaluating	Unit III: Privacy & Biometric Cryptography
IT611PE.4	**Design** watermarking techniques for biometric data protection and assess their robustness against various attacks.	6	Creating	Unit IV: Watermarking Techniques & Biometrics
IT611PE.5	**Develop** image enhancement techniques and implement biometric standards for interoperable systems.	6	Creating	Unit V: Image Enhancement & Biometric Standards

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	1	-	1	-	1	-	1	2	1	1	1
CO2	2	3	2	2	2	1	-	1	-	2	-	2	2	2	2	2
CO3	2	3	2	3	2	2	-	3	-	2	-	2	2	2	2	2
CO4	2	2	3	2	2	1	-	2	-	2	-	2	2	3	2	3
CO5	2	2	3	2	2	2	-	2	-	2	-	2	2	3	2	3
Average	**2**	**2.4**	**2.2**	**2.2**	**1.8**	**1.4**	**–**	**1.8**	**–**	**1.8**	**–**	**1.8**	**2**	**2.2**	**1.8**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis)** - Strongly addressed through analysis of biometric technologies and their performance. **PSO-2 (Software Development)** - Key in developing biometric algorithms and systems. **PSO-4 (Research)** - Essential for designing new biometric techniques and standards.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO8 (Ethics), PO12 (Life-long Learning), PSO-1 (Computer Systems)** - Biometric principles, system design, experimental analysis, tool usage, ethical considerations, and continuous learning are consistently applied.
Minor (1)	**PO6 (Society), PO10 (Communication), PSO-3 (Mathematical Concepts)** - Societal impact, technical communication, and mathematical foundations are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management)** - Environmental aspects, collaborative work, and project management are not emphasized in this technical biometrics course.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from fundamental concepts to designing and developing biometric security solutions.

MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT613PE: Principles of Programming Languages (Professional Elective – I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT613PE.1	**Explain** the fundamental concepts, evaluation criteria, and design trade-offs of programming languages, including syntax and semantics.	2	Understanding	Unit I: Preliminary Concepts & Syntax/Semantics
IT613PE.2	**Analyze** data types, control structures, names, bindings, and scoping mechanisms in various programming paradigms.	4	Analyzing	Unit II: Names, Bindings, Data Types & Control Structures
IT613PE.3	**Design** subprograms, abstract data types, and encapsulation constructs using appropriate parameter passing and implementation techniques.	6	Creating	Unit III: Subprograms & Abstract Data Types
IT613PE.4	**Evaluate** concurrency mechanisms, exception handling, and event handling in programming languages.	5	Evaluating	Unit IV: Concurrency & Exception Handling
IT613PE.5	**Compare** functional, logic, and scripting programming paradigms and implement solutions using languages like LISP, Prolog, or Python.	4	Analyzing	Unit V: Functional, Logic & Scripting Languages

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	-	-	-	-	1	-	2	1	2	2	1
CO2	2	3	2	2	1	-	-	-	-	1	-	2	1	2	3	1
CO3	2	2	3	2	2	-	-	-	-	2	-	2	1	3	2	2
CO4	2	3	2	3	1	-	-	1	-	2	-	2	1	2	2	2
CO5	2	2	2	2	2	-	-	-	-	2	-	2	1	3	2	2
Average	**2**	**2.4**	**2**	**2.2**	**1.4**	**–**	**–**	**0.2**	**–**	**1.6**	**–**	**2**	**1**	**2.4**	**2.2**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis)** - Strongly addressed through analysis of language design choices and paradigm comparisons. **PSO-2 (Software Development)** - Core to understanding programming language principles and their application in software development. **PSO-3 (Mathematical Concepts)** - Essential for formal syntax, semantics, and language theory.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO4 (Investigations), PO12 (Life-long Learning), PSO-4 (Research)** - Language design principles, paradigm implementation, comparative studies, continuous learning, and research in programming languages are consistently applied.
Minor (1)	**PO5 (Modern Tools), PO8 (Ethics), PO10 (Communication), PSO-1 (Computer Systems)** - Tool usage in language implementation, ethical coding considerations, technical communication, and system-level understanding are partially addressed.
No Mapping	**PO6 (Society), PO7 (Environment), PO9 (Teamwork), PO11 (Project Management)** - Societal impact, environmental aspects, collaborative work, and project management are not emphasized in this theoretical programming languages course.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from fundamental concepts to designing language constructs and evaluating paradigms.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT614PE: Distributed Databases (Professional Elective – I)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT614PE.1	**Explain** the architecture, design issues, and promises of distributed database systems, including fragmentation and allocation strategies.	2	Understanding	Unit I: Introduction & Distributed DBMS Architecture
IT614PE.2	**Apply** query decomposition, optimization algorithms, and join ordering techniques in distributed query processing.	3	Applying	Unit II: Query Processing & Optimization
IT614PE.3	**Analyze** concurrency control mechanisms, deadlock management, and reliability protocols in distributed transactions.	4	Analyzing	Unit III: Transaction Management
IT614PE.4	**Evaluate** parallel database architectures, data placement strategies, and load balancing techniques in distributed environments.	5	Evaluating	Unit IV: Distributed DBMS Reliability & Parallel Databases
IT614PE.5	**Design** distributed object database models, partitioning strategies, and query processing for object-oriented data.	6	Creating	Unit V: Object DBMS Model & Distributed Object Databases

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	1	-	-	-	-	1	-	1	2	2	2	1
CO2	2	3	2	2	2	-	-	-	-	1	-	1	2	2	3	1
CO3	2	3	2	3	2	-	-	1	-	2	-	2	2	2	2	2
CO4	2	3	2	3	2	-	-	1	-	2	-	2	2	2	2	2
CO5	2	2	3	2	2	-	-	1	-	2	-	2	2	3	2	3
Average	**2**	**2.6**	**2.2**	**2.4**	**1.8**	**–**	**–**	**0.6**	**–**	**1.6**	**–**	**1.6**	**2**	**2.2**	**2.2**	**1.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis)** - Strongly addressed through analysis of distributed query processing and optimization problems. **PO4 (Investigations)** - Essential for investigating concurrency control and reliability protocols. **PSO-2 (Software Development)** - Core to designing and implementing distributed database solutions.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO5 (Modern Tools), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-3 (Mathematical Concepts), PSO-4 (Research)** - Distributed database principles, system design, tool usage, algorithmic thinking, and research methodologies are consistently applied.
Minor (1)	**PO8 (Ethics), PO10 (Communication)** - Ethical considerations in data distribution and technical communication are partially addressed.
No Mapping	**PO6 (Society), PO7 (Environment), PO9 (Teamwork), PO11 (Project Management)** - Societal impact, environmental aspects, collaborative work, and project management are not emphasized in this technical distributed databases course.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from fundamental concepts to designing distributed database solutions and object-oriented data models.

MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT615PE: Software Testing Methodologies (Professional Elective II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT615PE.1	**Explain** the fundamental concepts, goals, phases, and taxonomy of software testing and bugs.	2	Understanding	Unit I: Introduction to Software Testing
IT615PE.2	**Apply** path testing, transaction flow testing, and data flow testing techniques to validate software behavior.	3	Applying	Unit II: Transaction Flow & Data Flow Testing
IT615PE.3	**Analyze** software logic and structure using path expressions, regular expressions, and flow anomaly detection methods.	4	Analyzing	Unit III: Path Products & Logic-Based Testing
IT615PE.4	**Evaluate** state transitions and design state-based tests to identify state graph bugs and transition errors.	5	Evaluating	Unit IV: State Graphs & Transition Testing
IT615PE.5	**Design** comprehensive test strategies using graph matrices and node reduction algorithms for complex software systems.	6	Creating	Unit V: Graph Matrices & Applications

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	1	-	2	-	1	-	1	1	2	1	1
CO2	2	3	2	2	2	1	-	2	-	2	-	2	1	2	2	2
CO3	2	3	2	3	2	1	-	2	-	2	-	2	1	2	3	2
CO4	2	3	2	3	2	1	-	2	-	2	-	2	1	2	2	2
CO5	2	3	3	3	2	2	-	2	1	2	1	2	2	3	2	3
Average	**2**	**2.8**	**2**	**2.6**	**1.8**	**1.2**	**–**	**2**	**0.2**	**1.8**	**0.2**	**1.8**	**1.2**	**2.2**	**2**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis)** - Strongly addressed through analysis of software defects, test case design, and bug taxonomy. **PO4 (Investigations)** - Essential for investigating software behavior through various testing methodologies. **PSO-2 (Software Development)** - Core to ensuring software quality and reliability through systematic testing.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO5 (Modern Tools), PO8 (Ethics), PO12 (Life-long Learning), PSO-3 (Mathematical Concepts), PSO-4 (Research)** - Testing principles, test design, tool usage, ethical testing practices, continuous learning, logical analysis, and research in testing methods are consistently applied.
Minor (1)	**PO6 (Society), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management), PSO-1 (Computer Systems)** - Societal impact of software quality, collaborative testing, test documentation, test planning, and system-level testing are partially addressed.
No Mapping	**PO7 (Environment)** - Environmental aspects are not emphasized in this software testing methodologies course.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from fundamental testing concepts to designing sophisticated test strategies for complex systems.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

IT653PE: Software Testing Methodologies Lab (Professional Elective II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT653PE.1	**Implement** GUI and functional testing using context-sensitive and analog mode recording for various application interfaces.	3	Applying	Expt 1-2: Recording & GUI Checkpoints
IT653PE.2	**Develop** database checkpoint testing and data-driven test cases using flat files, front grids, and Excel datasets.	6	Creating	Expt 6-9: Database & Data-driven Testing
IT653PE.3	**Execute** batch testing with parameter passing and silent mode test execution for automated testing scenarios.	3	Applying	Expt 10-13: Batch Testing & Automation

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	3	-	-	2	2	2	1	2	2	3	2	2
CO2	2	3	2	3	3	-	-	2	2	2	1	2	2	3	2	2
CO3	2	2	2	2	3	-	-	2	2	2	2	2	2	3	2	2
Average	**2**	**2.33**	**2**	**2.33**	**3**	**–**	**–**	**2**	**2**	**2**	**1.33**	**2**	**2**	**3**	**2**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5 (Modern Tools), PSO-2 (Software Development)** - Strongly addressed through hands-on testing tool implementation and quality assurance practices.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO8 (Ethics), PO9 (Teamwork), PO10 (Communication), PO12 (Life-long Learning), PSO-1 (Computer Systems)** - Testing principles, defect analysis, test design, ethical testing, collaboration, and continuous learning are consistently applied.
Minor (1)	**PO11 (Project Management)** - Test planning and management are partially addressed.
No Mapping	**PO6 (Society), PO7 (Environment), PSO-3 (Mathematical Concepts), PSO-4 (Research)** - Societal impact, environmental aspects, mathematical foundations, and research are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Focus on applying testing techniques and creating comprehensive test scenarios.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

CS617PE: Devops (Professional Elective-II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS617PE.1	**Explain** the principles of DevOps, Agile development, and the DevOps lifecycle including continuous delivery and release management.	2	Understanding	Unit I: Introduction to DevOps
CS617PE.2	**Analyze** software architecture in the context of DevOps, including microservices, monolithic scenarios, and resilience considerations.	4	Analyzing	Unit II: DevOps Influence on Architecture
CS617PE.3	**Apply** source code management using Git, implement project management workflows, and manage code migrations.	3	Applying	Unit III: Project Management & SCM
CS617PE.4	**Implement** continuous integration systems using Jenkins, manage build dependencies, and configure build pipelines.	3	Applying	Unit IV: System Integration
CS617PE.5	**Evaluate** testing tools, automation strategies, and deployment systems including virtualization, containerization, and configuration management.	5	Evaluating	Unit V: Testing & Deployment

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	2	1	-	1	1	2	1	2	1	2	1	1
CO2	2	3	3	2	2	1	-	1	1	2	1	2	2	3	2	2
CO3	2	2	2	2	3	1	-	2	2	2	2	2	2	3	1	2
CO4	2	2	2	2	3	1	-	1	2	2	2	2	2	3	1	2
CO5	2	3	3	3	3	2	1	2	2	2	2	3	2	3	2	3
Average	**2**	**2.4**	**2.4**	**2**	**2.6**	**1.2**	**0.2**	**1.4**	**1.6**	**2**	**1.6**	**2.2**	**1.8**	**2.8**	**1.4**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - Strongly addressed through DevOps practices, CI/CD pipelines, and automated software delivery. **PO5 (Modern Tool Usage)** - Essential for using DevOps tools like Git, Jenkins, Docker, and configuration management systems.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management), PO12 (Life-long Learning), PSO-4 (Research)** - DevOps principles, architectural analysis, collaborative workflows, tool integration, project coordination, continuous learning, and research in DevOps practices are consistently applied.
Minor (1)	**PO6 (Society), PO7 (Environment), PO8 (Ethics), PSO-1 (Computer Systems), PSO-3 (Mathematical Concepts)** - Societal impact of rapid delivery, environmental considerations of infrastructure, ethical deployment, system operations, and algorithmic efficiency are partially addressed.
No Mapping	All POs and PSOs show at least some correlation with the course outcomes.
Cognitive Range	**BTL 2–5 (Understanding → Evaluating)** - Comprehensive progression from understanding DevOps concepts to evaluating tools and strategies for automated software delivery.

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MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

CS662PE: Devops Lab (Professional Elective – II Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Coverage / Experiment Group
CS662PE.1	**Implement** version control systems using Git and GitHub for collaborative software development and code management.	3	Applying	Expt 2-3: Git & GitHub
CS662PE.2	**Develop** continuous integration and deployment pipelines using Jenkins, Docker, and Kubernetes for automated software delivery.	6	Creating	Expt 4-9: CI/CD & Containerization
CS662PE.3	**Design** and **execute** automated testing strategies using Selenium for web applications and containerized environments.	6	Creating	Expt 10-12: Automated Testing

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	3	-	-	2	3	2	2	2	2	3	1	2
CO2	2	3	3	2	3	1	-	2	3	2	2	2	2	3	1	2
CO3	2	2	3	2	3	1	-	2	3	2	2	2	2	3	1	2
Average	**2**	**2.33**	**2.67**	**2**	**3**	**0.67**	**–**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5 (Modern Tools), PO9 (Teamwork), PSO-2 (Software Development)** - Strongly addressed through DevOps tool implementation, collaborative workflows, and automated software delivery.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO8 (Ethics), PO10 (Communication), PO11 (Project Management), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-4 (Research)** - DevOps principles, pipeline design, ethical practices, project coordination, and infrastructure research are consistently applied.
Minor (1)	**PO6 (Society)** - Societal impact of rapid delivery is partially addressed.
No Mapping	**PO7 (Environment), PSO-3 (Mathematical Concepts)** - Environmental aspects and mathematical foundations are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Strong focus on applying DevOps practices and creating automated deployment pipelines.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT711PE: Machine Learning (Professional Elective III)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT711PE.1	**Explain** the fundamental concepts of machine learning, concept learning, and decision tree learning with appropriate problem identification.	2	Understanding	Unit I: Introduction & Concept Learning
IT711PE.2	**Apply** artificial neural networks including perceptron's and back-propagation algorithms for pattern recognition tasks.	3	Applying	Unit II: Artificial Neural Networks
IT711PE.3	**Analyze** Bayesian learning methods, instance-based learning, and genetic algorithms for different learning scenarios.	4	Analyzing	Unit III: Bayesian Learning & Genetic Algorithms
IT711PE.4	**Evaluate** rule-based learning systems, reinforcement learning techniques, and their applications in various domains.	5	Evaluating	Unit IV: Rule-Based & Reinforcement Learning
IT711PE.5	**Design** analytical learning solutions by combining inductive and analytical approaches for complex learning problems.	6	Creating	Unit V: Analytical Learning

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	-	-	-	-	1	-	2	1	1	2	1
CO2	2	2	2	2	2	-	-	-	-	1	-	2	1	2	3	2
CO3	2	3	2	3	2	-	-	-	-	2	-	2	1	2	3	2
CO4	2	3	2	3	2	1	-	1	-	2	-	2	1	2	3	2
CO5	2	3	3	3	2	1	-	1	-	2	-	3	1	3	3	3
Average	**2**	**2.6**	**2**	**2.6**	**1.8**	**0.4**	**–**	**0.4**	**–**	**1.6**	**–**	**2.2**	**1**	**2**	**2.8**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Mathematical Concepts)** - Strongly addressed through statistical learning, probability theory, and algorithmic mathematics in ML. **PO2 (Problem Analysis)** - Key in analyzing learning problems and algorithm selection. **PO4 (Investigations)** - Essential for experimental analysis and model evaluation.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO5 (Modern Tools), PO12 (Life-long Learning), PSO-2 (Software Development), PSO-4 (Research)** - ML principles, algorithm design, tool usage, continuous learning, and research methodology are consistently applied.
Minor (1)	**PO6 (Society), PO8 (Ethics), PO10 (Communication)** - Basic societal impact, ethical considerations in AI, and technical communication are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems)** - Environmental aspects, collaborative work, project management, and hardware focus are not emphasized.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from fundamental concepts to designing ML solutions, covering all cognitive levels essential for machine learning.

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MR21 – Revised Course Outcome
B.Tech. VII Semester

Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT752PE: Machine Learning Lab (Professional Elective – III Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT752PE.1	**Implement** supervised learning algorithms including Find-S, decision trees, and neural networks for classification and pattern recognition tasks.	3	Applying	Expt 1-4: Find-S, Decision Trees, Perceptrons
IT752PE.2	**Apply** probabilistic methods and regression techniques using Bayesian classifiers, linear regression, and K-nearest neighbors for predictive modeling.	3	Applying	Expt 5-8: Bayesian, Regression, KNN
IT752PE.3	**Design** unsupervised learning solutions using K-means clustering and genetic algorithms for data segmentation and optimization problems.	6	Creating	Expt 9-10: Clustering & Genetic Algorithms

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03	PS04
CO1	2	3	2	2	3	-	-	1	2	2	-	2	2	3	3	2
CO2	2	3	2	3	3	-	-	1	2	2	-	2	2	3	3	2
CO3	2	3	3	3	3	-	-	1	2	2	-	2	2	3	3	3
Average	**2**	**3**	**2.33**	**2.67**	**3**	**–**	**–**	**1**	**2**	**2**	**–**	**2**	**2**	**3**	**3**	**2.33**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis), PO5 (Modern Tools), PSO-2 (Software Development), PSO-3 (Mathematical Concepts)** - Strongly addressed through implementing ML algorithms, using ML tools, developing applications, and applying mathematical concepts.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO4 (Investigations), PO9 (Teamwork), PO10 (Communication), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-4 (Research)** - ML principles, experimental design, collaboration, documentation, and research methods are consistently applied.
Minor (1)	**PO8 (Ethics)** - Ethical considerations in ML are partially addressed.
No Mapping	**PO6 (Society), PO7 (Environment), PO11 (Project Management)** - Societal impact, environmental aspects, and project management are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Focus on applying ML algorithms and creating ML solutions.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT712PE: Mobile Application Development (Professional Elective III)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT712PE.1	**Explain** the Android OS architecture, development framework, and application lifecycle components.	2	Understanding	Unit I: Introduction to Android OS
IT712PE.2	**Design** user interfaces using layouts, UI components, fragments, and event handling mechanisms.	6	Creating	Unit II: Android User Interface
IT712PE.3	**Implement** intents, broadcasts, notifications, and inter-component communication in Android applications.	3	Applying	Unit III: Intents and Broadcasts
IT712PE.4	**Develop** persistent storage solutions using shared preferences, files, and SQLite databases.	6	Creating	Unit IV: Persistent Storage
IT712PE.5	**Create** complete mobile applications integrating multiple Android components and system services.	6	Creating	Unit V: Advanced Application Development

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	2	-	-	1	-	1	-	1	2	2	1	1
CO2	2	2	3	2	2	1	-	1	1	2	1	2	2	3	1	2
CO3	2	2	2	2	2	-	-	1	1	2	1	1	2	3	1	2
CO4	2	2	3	2	2	-	-	2	1	2	1	2	2	3	1	2
CO5	2	3	3	2	2	1	-	2	2	2	2	2	2	3	1	3
Average	**2**	**2.2**	**2.6**	**1.8**	**2**	**0.4**	**–**	**1.4**	**1**	**1.8**	**1**	**1.6**	**2**	**2.8**	**1**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - Strongly addressed through mobile app design, development, and implementation. **PO3 (Design Solutions)** - Core to creating user interfaces and application architecture.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO4 (Investigations), PO5 (Modern Tools), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-4 (Research)** - Mobile development principles, problem-solving, tool usage, collaboration, and continuous learning are consistently applied.
Minor (1)	**PO6 (Society), PO8 (Ethics)** - Societal impact of mobile apps and ethical development practices are partially addressed.
No Mapping	**PO7 (Environment), PSO-3 (Mathematical Concepts)** - Environmental aspects and mathematical foundations are not emphasized.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from OS concepts to creating complete mobile applications.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
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IT753PE: Mobile Application Development Lab (Professional Elective – III Lab)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT753PE.1	**Develop** basic Android applications with user interfaces, event handling, and multiple screen navigation using different layout managers.	6	Creating	Expt 1-3: Basic Apps, UI Layouts, Fragments
IT753PE.2	**Implement** advanced Android features including intents, broadcasts, notifications, and inter-component communication for enhanced user experience.	3	Applying	Expt 4-5: Intents, Broadcasts, Notifications
IT753PE.3	**Design** and **integrate** persistent storage solutions using files, shared preferences, SQLite databases, and content providers for data-driven mobile applications.	6	Creating	Expt 6-13: Storage, Database, System Integration

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	2	3	1	-	1	2	2	1	2	2	3	1	2
CO2	2	2	2	2	3	1	-	1	2	2	1	2	2	3	1	2
CO3	2	3	3	2	3	1	-	2	2	2	2	2	2	3	1	3
Average	**2**	**2.33**	**2.67**	**2**	**3**	**1**	**–**	**1.33**	**2**	**2**	**1.33**	**2**	**2**	**3**	**1**	**2.33**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO5 (Modern Tools), PSO-2 (Software Development)** - Strongly addressed through Android development tools and mobile application creation.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO9 (Teamwork), PO10 (Communication), PO11 (Project Management), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-4 (Research)** - Mobile development principles, UI design, collaboration, and continuous learning are consistently applied.
Minor (1)	**PO6 (Society), PO8 (Ethics)** - Societal impact and ethical app development are partially addressed.
No Mapping	**PO7 (Environment), PSO-3 (Mathematical Concepts)** - Environmental aspects and mathematical foundations are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Strong focus on applying mobile development concepts and creating complete applications.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
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IT713PE: Web & Database Security (Professional Elective IV)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT713PE.1	**Analyze** web security landscape, cryptography, and digital identification techniques for secure web applications.	4	Analyzing	Unit I: Web Technology & Security
IT713PE.2	**Implement** privacy protection techniques and server security measures for web applications.	3	Applying	Unit II: Privacy & Server Security
IT713PE.3	**Evaluate** access control models and security policies for database systems and XML data.	5	Evaluating	Unit III: Database Security
IT713PE.4	**Design** security re-engineering solutions and database watermarking techniques for copyright protection.	6	Creating	Unit IV: Security Re-engineering
IT713PE.5	**Develop** privacy-enhanced access control systems for database publishing and mobile environments.	6	Creating	Unit V: Future Trends

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	2	1	-	2	-	2	-	2	2	2	2	2
CO2	2	2	2	2	2	1	-	3	-	2	-	2	2	2	1	2
CO3	2	3	2	3	2	1	-	3	-	2	-	2	2	2	2	2
CO4	2	2	3	2	2	1	-	3	-	2	-	2	2	3	2	3
CO5	2	2	3	2	2	2	-	3	-	2	-	2	2	3	2	3
Average	**2**	**2.4**	**2.4**	**2.2**	**2**	**1.2**	**–**	**2.8**	**–**	**2**	**–**	**2**	**2**	**2.4**	**1.8**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO8 (Ethics)** - Strongly addressed through privacy protection, ethical security practices, and digital rights management. **PSO-2 (Software Development)** - Core to developing secure web and database applications. **PSO-4 (Research)** - Essential for security re-engineering and future trends.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO6 (Society), PO10 (Communication), PO12 (Life-long Learning), PSO-1 (Computer Systems)** - Security principles, threat analysis, secure design, tool usage, and continuous learning are consistently applied.
Minor (1)	**PO11 (Project Management)** - Security project planning is partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PSO-3 (Mathematical Concepts)** - Environmental aspects, collaboration, and mathematical foundations are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Focus on applying security measures and creating secure systems.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
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IT714PE: Data Visualization (Professional Elective IV)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT714PE.1	**Apply** statistical methods and descriptive data analysis using R for data visualization tasks.	3	Applying	Unit I: Introduction to Statistics
IT714PE.2	**Manipulate** data using R packages (dplyr, tidyr) and create visualizations using Watson Studio.	3	Applying	Unit II: Data Manipulation with R
IT714PE.3	**Implement** data operations using Python, NumPy, and Pandas for data analysis and preparation.	3	Applying	Unit III: Python for Data Analysis
IT714PE.4	**Design** visualizations using Matplotlib and create specialized charts for data representation.	6	Creating	Unit IV: Data Visualization Tools
IT714PE.5	**Develop** advanced visualizations using Seaborn and spatial analysis with Folium for case studies.	6	Creating	Unit V: Advanced Visualization

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03	PS04
CO1	2	2	1	2	2	1	-	1	-	1	-	1	1	2	2	1
CO2	2	2	2	2	2	1	-	1	-	1	-	1	1	2	2	1
CO3	2	2	2	2	2	1	-	1	-	1	-	1	1	2	2	1
CO4	2	2	3	2	2	2	-	1	-	2	-	2	1	3	2	2
CO5	2	2	3	2	2	2	-	1	-	2	-	2	1	3	2	3
Average	**2**	**2**	**2.2**	**2**	**2**	**1.4**	**–**	**1**	**–**	**1.4**	**–**	**1.4**	**1**	**2.4**	**2**	**1.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - Strongly addressed through visualization tool development and data application creation. **PSO-3 (Mathematical Concepts)** - Core to statistical analysis and data representation.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO6 (Society), PO10 (Communication), PO12 (Life-long Learning), PSO-4 (Research)** - Data principles, analytical thinking, visualization design, tool proficiency, and research applications are consistently applied.
Minor (1)	**PO8 (Ethics)** - Ethical data representation is partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems)** - Environmental aspects, collaboration, project management, and hardware focus are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Focus on applying visualization techniques and creating advanced data representations.

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MR21 – Revised Course Outcome
B.Tech. VII Semester
Regulation: MR21 **Year/Sem: IV /I** **Department: IT**

IT715PE: Quantum Computing (Professional Elective IV)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT715PE.1	**Apply** linear algebra concepts and complex number theory to quantum computing fundamentals.	3	Applying	Unit I: Essential Linear Algebra
IT715PE.2	**Analyze** quantum physics principles, entanglement, and quantum key distribution protocols.	4	Analyzing	Unit II: Quantum Physics & Theory
IT715PE.3	**Evaluate** quantum architecture, gates, circuits, and hardware requirements for quantum systems.	5	Evaluating	Unit III: Quantum Architecture & Hardware
IT715PE.4	**Implement** quantum algorithms including Deutsch, Shor, and Grover algorithms for problem-solving.	3	Applying	Unit IV: Quantum Algorithms
IT715PE.5	**Assess** the impact of quantum computing on cryptography and current security algorithms.	5	Evaluating	Unit V: Cryptography Impact

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2	1	-	-	-	-	1	-	2	1	1	3	1
CO2	2	3	2	2	1	-	-	-	-	2	-	2	1	1	3	2
CO3	2	3	2	3	2	-	-	-	-	2	-	2	2	2	3	2
CO4	2	3	2	2	2	-	-	-	-	2	-	2	2	2	3	2
CO5	2	3	2	3	2	2	-	2	-	2	-	2	2	2	3	3
Average	**2**	**2.8**	**1.8**	**2.4**	**1.6**	**0.4**	**–**	**0.4**	**–**	**1.8**	**–**	**2**	**1.6**	**1.6**	**3**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Mathematical Concepts)** - Strongly addressed through quantum mathematics, linear algebra, and algorithmic theory. **PO2 (Problem Analysis)** - Core to analyzing quantum problems and algorithm selection.
Moderate (2)	**PO1 (Engineering Knowledge), PO4 (Investigations), PO6 (Society), PO8 (Ethics), PO12 (Life-long Learning), PSO-4 (Research)** - Quantum principles, experimental analysis, societal impact, ethical considerations, and research methodology are consistently applied.
Minor (1)	**PO3 (Design Solutions), PO5 (Modern Tools), PO10 (Communication)** - Quantum system design, tool usage, and technical communication are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems), PSO-2 (Software Development)** - Environmental aspects, collaboration, project management, classical systems, and traditional software are not emphasized.
Cognitive Range	**BTL 3–5 (Applying → Evaluating)** - Focus on applying quantum concepts and evaluating quantum systems and their impact.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

IT811PE: Intrusion Detection Systems (Professional Elective V)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT811PE.1	**Analyze** threats against computer systems and evaluate network security solutions including vulnerability assessment.	4	Analyzing	Unit I: Introduction to Cyber Threats
IT811PE.2	**Classify** different types of attacks and attackers across network, application, and human layers.	4	Analyzing	Unit II: Classes of Attacks & Attackers
IT811PE.3	**Implement** signature-based intrusion detection solutions using tools like Snort and evaluate their effectiveness.	3	Applying	Unit III: IDS Models & Solutions
IT811PE.4	**Design** anomaly detection systems using network behavior analysis and host-based monitoring techniques.	6	Creating	Unit IV: Anomaly Detection Systems
IT811PE.5	**Develop** comprehensive security strategies using attack trees, malware detection, and collaborative security approaches.	6	Creating	Unit V: Advanced Security Strategies

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	2	-	2	-	2	-	2	2	2	2	2
CO2	2	3	2	3	2	2	-	2	-	2	-	2	2	2	2	2
CO3	2	2	2	2	3	1	-	2	-	2	-	2	2	3	2	2
CO4	2	3	3	3	2	2	-	2	-	2	-	2	2	3	2	3
CO5	2	3	3	3	2	2	-	3	1	2	1	2	2	3	2	3
Average	**2**	**2.8**	**2.4**	**2.8**	**2.2**	**1.8**	**–**	**2.2**	**0.2**	**2**	**0.2**	**2**	**2**	**2.6**	**2**	**2.4**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis), PO4 (Investigations)** - Strongly addressed through threat analysis, attack classification, and security investigation. **PSO-2 (Software Development)** - Core to developing intrusion detection systems and security solutions.
Moderate (2)	**PO1 (Engineering Knowledge), PO3 (Design Solutions), PO5 (Modern Tools), PO6 (Society), PO8 (Ethics), PO10 (Communication), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-4 (Research)** - Security principles, system design, tool usage, societal impact, ethical hacking, and research are consistently applied.
Minor (1)	**PO9 (Teamwork), PO11 (Project Management)** - Collaborative security and project planning are partially addressed.
No Mapping	**PO7 (Environment), PSO-3 (Mathematical Concepts)** - Environmental aspects and mathematical foundations are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Focus on applying security principles and creating advanced detection systems.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester
Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

IT812PE: Augmented Reality & Virtual Reality (Professional Elective V)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT812PE.1	**Explain** augmented reality concepts, technologies, and applications across different domains.	2	Understanding	Unit I: Introduction to AR
IT812PE.2	**Analyze** AR components and devices including HMDs, display systems, and tracking technologies.	4	Analyzing	Unit II: AR Devices & Components
IT812PE.3	**Evaluate** virtual reality systems, human perception factors, and key elements of VR experiences.	5	Evaluating	Unit III: Introduction to VR
IT812PE.4	**Design** virtual world representations using visual, aural, and haptic rendering techniques.	6	Creating	Unit IV: Virtual World Representation
IT812PE.5	**Develop** VR applications considering visual perception, rendering optimization, and latency management.	6	Creating	Unit V: Visual Perception & Rendering

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	2	1	-	1	-	1	-	1	2	2	1	1
CO2	2	3	2	2	2	1	-	1	-	2	-	2	2	2	2	2
CO3	2	3	2	3	2	2	-	1	-	2	-	2	2	2	2	2
CO4	2	2	3	2	2	2	-	1	-	2	-	2	2	3	2	3
CO5	2	2	3	2	2	2	-	1	1	2	1	2	2	3	2	3
Average	**2**	**2.4**	**2.4**	**2**	**2**	**1.6**	**–**	**1**	**0.2**	**1.8**	**0.2**	**1.8**	**2**	**2.4**	**1.8**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - Strongly addressed through AR/VR application development and system design. **PSO-4 (Research)** - Essential for innovative AR/VR solutions and emerging technologies.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO6 (Society), PO10 (Communication), PO12 (Life-long Learning), PSO-1 (Computer Systems)** - AR/VR principles, system analysis, design, tool usage, and applications are consistently applied.
Minor (1)	**PO8 (Ethics), PO9 (Teamwork), PO11 (Project Management)** - Ethical considerations, collaboration, and project planning are partially addressed.
No Mapping	**PO7 (Environment), PSO-3 (Mathematical Concepts)** - Environmental aspects and mathematical foundations are not emphasized.
Cognitive Range	**BTL 2–6 (Understanding → Creating)** - Comprehensive progression from concepts to application development.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

CS811PE: Social Networks Analysis (Professional Elective V)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS811PE.1	**Analyze** social media technologies and social network structures using network analysis principles.	4	Analyzing	Unit I: Social media & Networks
CS811PE.2	**Apply** NodeXL for network mapping, visualization design, and metric calculation in social networks.	3	Applying	Unit II: NodeXL & Network Metrics
CS811PE.3	**Evaluate** email networks, message boards, and Twitter conversations for social interaction patterns.	5	Evaluating	Unit III: Communication Networks
CS811PE.4	**Design** Facebook network visualizations and analyze hyperlink structures in web networks.	6	Creating	Unit IV: Social Platform Networks
CS811PE.5	**Develop** YouTube and Wiki network analyses to study content interaction and collaborative patterns.	6	Creating	Unit V: Content & Collaboration Networks

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	2	-	2	-	2	-	2	2	2	2	2
CO2	2	2	2	2	3	1	-	1	-	2	-	2	2	3	2	2
CO3	2	3	2	3	2	2	-	2	-	2	-	2	2	2	3	3
CO4	2	2	3	2	2	2	-	2	-	2	-	2	2	3	2	3
CO5	2	2	3	2	2	2	-	2	1	2	1	2	2	3	2	3
Average	**2**	**2.4**	**2.4**	**2.4**	**2.2**	**1.8**	**–**	**1.8**	**0.2**	**2**	**0.2**	**2**	**2**	**2.6**	**2.2**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - Strongly addressed through social network analysis tools and application development. **PSO-4 (Research)** - Essential for social media research and network pattern analysis.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO6 (Society), PO8 (Ethics), PO10 (Communication), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-3 (Mathematical Concepts)** - Network principles, analysis, design, tool usage, societal impact, and mathematical modelling are consistently applied.
Minor (1)	**PO9 (Teamwork), PO11 (Project Management)** - Collaboration and project planning are partially addressed.
No Mapping	**PO7 (Environment)** - Environmental aspects are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Focus on applying analysis tools and creating network visualizations.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester
Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

IT813PE: Natural Language Processing (Professional Elective VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
IT813PE.1	**Analyze** word structure components and document structure finding methods in NLP systems.	4	Analyzing	Unit I: Word & Document Structure
IT813PE.2	**Implement** syntax analysis using parsing algorithms and treebank approaches for natural language.	3	Applying	Unit II: Syntax Analysis
IT813PE.3	**Design** semantic parsing systems for word sense disambiguation and meaning representation.	6	Creating	Unit III: Semantic Parsing
IT813PE.4	**Develop** predicate-argument structures and discourse processing for cohesive text analysis.	6	Creating	Unit IV: Predicate & Discourse
IT813PE.5	**Evaluate** language modelling techniques including N-gram models and cross lingual applications.	5	Evaluating	Unit V: Language Modelling

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	2	1	-	1	-	1	-	2	1	2	2	1
CO2	2	2	2	2	2	1	-	1	-	1	-	2	1	3	3	2
CO3	2	2	3	2	2	2	-	1	-	2	-	2	1	3	2	2
CO4	2	2	3	2	2	2	-	1	-	2	-	2	1	3	2	3
CO5	2	3	2	3	2	2	-	1	-	2	-	2	1	2	3	3
Average	**2**	**2.4**	**2.4**	**2.2**	**2**	**1.6**	**–**	**1**	**–**	**1.6**	**–**	**2**	**1**	**2.6**	**2.4**	**2.2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-2 (Software Development)** - Strongly addressed through NLP system implementation and language processing applications. **PSO-3 (Mathematical Concepts)** - Core to language modelling and statistical NLP.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO6 (Society), PO10 (Communication), PO12 (Life-long Learning), PSO-4 (Research)** - NLP principles, language analysis, system design, tool usage, and research applications are consistently applied.
Minor (1)	**PO8 (Ethics)** - Ethical considerations in language processing are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems)** - Environmental aspects, collaboration, project management, and hardware focus are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Focus on applying NLP techniques and creating language processing systems.

MR21 – Revised Course Outcome
B.Tech. VIII Semester

Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

CS818PE: Neural Networks and Deep Learning (Professional Elective – VI)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS818PE.1	**Implement** artificial neural networks using perceptron's, multilayer networks, and backpropagation algorithms.	3	Applying	Unit I: Artificial Neural Networks
CS818PE.2	**Design** deep feedforward networks with appropriate architecture, hidden units, and optimization methods.	6	Creating	Unit II: Deep Feedforward Networks
CS818PE.3	**Develop** convolutional neural networks using architectures like LeNet, AlexNet, and VGG for image processing.	6	Creating	Unit III: Convolutional Neural Networks
CS818PE.4	**Create** recurrent neural networks with LSTM, GRU, and encoder-decoder architectures for sequence data.	6	Creating	Unit IV: Recurrent Neural Networks
CS818PE.5	**Evaluate** deep learning applications in computer vision, speech recognition, and natural language processing.	5	Evaluating	Unit V: DL Applications

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	2	-	-	-	-	1	-	2	1	2	3	1
CO2	2	3	3	2	2	-	-	-	-	2	-	2	1	3	3	2
CO3	2	2	3	2	2	-	-	-	-	2	-	2	1	3	3	2
CO4	2	2	3	2	2	-	-	-	-	2	-	2	1	3	3	2
CO5	2	3	2	3	2	2	-	1	-	2	-	2	1	2	3	3
Average	**2**	**2.4**	**2.6**	**2.2**	**2**	**0.4**	**–**	**0.2**	**–**	**1.8**	**–**	**2**	**1**	**2.6**	**3**	**2**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-3 (Mathematical Concepts)** - Strongly addressed through neural network mathematics and deep learning algorithms. **PSO-2 (Software Development)** - Core to implementing deep learning systems and applications.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO6 (Society), PO10 (Communication), PO12 (Life-long Learning), PSO-4 (Research)** - Deep learning principles, network design, tool usage, and research applications are consistently applied.
Minor (1)	**PO8 (Ethics)** - Ethical AI considerations are partially addressed.
No Mapping	**PO7 (Environment), PO9 (Teamwork), PO11 (Project Management), PSO-1 (Computer Systems)** - Environmental aspects, collaboration, project management, and hardware focus are not emphasized.
Cognitive Range	**BTL 3–6 (Applying → Creating)** - Strong focus on implementing and creating deep learning solutions.

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MR21 – Revised Course Outcome
B.Tech. VIII Semester
Regulation: MR21 **Year/Sem: IV /II** **Department: IT**

CS828PE: Blockchain Technology (Professional Elective - VI)

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS828PE.1	**Analyze** blockchain fundamentals, distributed trust concepts, and cryptocurrency working principles.	4	Analyzing	Unit I: Blockchain Introduction
CS828PE.2	**Evaluate** extensible blockchain concepts including digital identity and tokenization applications.	5	Evaluating	Unit II: Extensible Blockchain
CS828PE.3	**Design** blockchain applications for scientific computing, genomics, and educational platforms.	6	Creating	Unit III: Blockchain Science
CS828PE.4	**Develop** currency systems, token economies, and digital asset management using blockchain.	6	Creating	Unit IV: Currency & Token Systems
CS828PE.5	**Assess** technical challenges, business models, and regulatory aspects of blockchain implementation.	5	Evaluating	Unit V: Challenges & Regulations

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2	2	2	-	2	-	2	-	2	2	2	2	2
CO2	2	3	2	3	2	2	-	2	-	2	-	2	2	2	2	2
CO3	2	2	3	2	2	2	-	2	-	2	-	2	2	3	2	3
CO4	2	2	3	2	2	2	-	3	-	2	-	2	2	3	2	3
CO5	2	3	2	3	2	3	-	3	1	2	2	2	2	2	2	3
Average	**2**	**2.6**	**2.4**	**2.4**	**2**	**2.2**	**–**	**2.4**	**0.2**	**2**	**0.4**	**2**	**2**	**2.4**	**2**	**2.6**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PSO-4 (Research)** - Strongly addressed through blockchain innovation and emerging applications. **PO8 (Ethics)** - Core to blockchain ethics, transparency, and trust mechanisms.
Moderate (2)	**PO1 (Engineering Knowledge), PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO5 (Modern Tools), PO6 (Society), PO10 (Communication), PO11 (Project Management), PO12 (Life-long Learning), PSO-1 (Computer Systems), PSO-2 (Software Development), PSO-3 (Mathematical Concepts)** - Blockchain principles, system design, cryptographic foundations, and applications are consistently applied.
Minor (1)	**PO9 (Teamwork)** - Collaborative blockchain development is partially addressed.
No Mapping	**PO7 (Environment)** - Environmental aspects of blockchain are not emphasized.
Cognitive Range	**BTL 4–6 (Analyzing → Creating)** - Strong focus on analyzing blockchain concepts and creating innovative applications.

MR21 – Revised Course Outcome
B.Tech. VI Semester

Regulation: MR21 **Year/Sem: III /II** **Department: IT**

CE732OE: Environmental Impact Assessment (Open Elective - II)

Course Outcomes

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

CO Code	Course Outcome	BTL	Cognitive Domain Keyword	Linked Unit / Module
CS828PE.1	**Analyze** EIA methodologies and apply impact evaluation techniques for environmental baseline mapping and parameter classification.	4	Analyzing	Unit I: Basic Concepts & Methodologies of EIA
CS828PE.2	**Evaluate** the impacts of developmental activities on vegetation and wildlife and assess the consequences of deforestation.	5	Evaluating	Unit II: EIA on Vegetation and Wildlife
CS828PE.3	**Assess** impacts on soil, water, and air quality, and formulate appropriate mitigation measures for environmental protection.	5	Evaluating	Unit III: EIA on Soil, Water and Air Quality
CS828PE.4	**Design** environmental audit protocols and prepare comprehensive audit reports following established environmental standards.	6	Creating	Unit IV: Environmental Audit & Legislation
CS828PE.5	**Develop** EIA statements for various industries by applying relevant environmental acts and case study analysis.	6	Creating	Unit V: Environmental Acts & Case Studies

Course Articulation Matrix

CO / PO / PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	2	2	2	1	–	–	–	1	–	3	–	2
CO2	2	3	3	2	2	3	3	2	–	–	–	1	–	3	–	3
CO3	2	3	3	2	2	3	3	2	–	–	–	1	–	3	–	3
CO4	2	3	3	3	3	3	3	3	–	–	–	2	–	3	–	3
CO5	2	3	3	3	3	3	3	3	–	–	–	2	–	3	–	3
Average	**2.2**	**3**	**2.8**	**2.6**	**2.4**	**2.8**	**2.8**	**2.2**	–	–	–	**1.4**	–	**3**	–	**2.8**

Justification

Aspect	Observation / Reasoning
Strong (3)	**PO2 (Problem Analysis), PO3 (Design Solutions), PO4 (Investigations), PO6 (Society), PO7 (Environment), PSO-2 (Interdisciplinary Knowledge), PSO-4 (Research & Analytical Tools)** – Strongly addressed through environmental impact identification, detailed assessment methodologies, sustainability evaluation, environmental audit procedures, and preparation of EIA statements. These COs require advanced analysis, evaluation, and creation of environmental solutions.
Moderate (2)	**PO1 (Engineering Knowledge), PO5 (Modern Tools), PO8 (Ethics), PO10 (Communication), PO12 (Lifelong Learning)** – Environmental principles, use of analytical tools, ethical compliance with environmental acts, technical reporting, and continuous learning of updated EIA legislation are consistently applied but not the primary focus of the course.
Minor (1)	**PO9 (Teamwork)** – Collaborative environmental assessment and group-based case study evaluation are partially addressed, though not emphasized as a dedicated project requirement.
No Mapping	**PSO-1 (Computer Systems), PSO-3 (Mathematical Concepts)** – Hardware/computing system fundamentals and algorithmic problem-solving are not relevant to this environmental management–oriented elective.
Cognitive Range	**BTL 4–6 (Analyzing → Evaluating → Creating)** – The course demands higher-order cognitive skills such as analyzing environmental impacts, evaluating mitigation strategies, designing audit protocols, and creating comprehensive EIA statements.

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