I.K. Gujral Punjab Technical University, Kapurthala (Main Campus)
Department of Computer Science & Engineering

B. Tech CSE

3rd Sem

HOD
Department of Computer Science & Engineering
IKG PTU Main Campus
Kapurthala

Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS( ) : (Data Structure)

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness;	3	3	2	3	2	3	0	0	0	0	1	3	3	3	1	0	Analyze	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Student will be able to handle operation like searching, insertion, deletion, traversing on various Data Structures and determine time and computational complexity	3	3	2	2	1	2	0	0	1	0	1	3	3	3	1	0	Analyze	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity;	3	3	3	3	1	1	0	0	1	0	1	3	3	3	1	0	design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Students will be able to choose appropriate Data Structure as applied to specific problem definition	3	3	3	3	2	2	0	0	3	0	3	3	3	3	1	0	Apply	Employability	
CO5	Demonstrate the reusability of Data Structures for implementing complex iterative problems	3	3	3	3	2	2	0	0	3	0	3	3	3	3	1	0	Demonstrate	Employability	

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : (Object oriented programming)

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC-BTEC-502-18: Digital Signal Processing)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	Identify classes, objects, members of a class and the relationships among them needed to solve a specific problem operotors	3	3	3	3	2	3	0	0	0	0	1	3	3	3	1	0	identify	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Demonstrate the concept of constructors and destructors. And create new definitions for some of the operators	3	3	3	3	1	2	0	0	1	0	1	3	3	3	1	0	Demonstratre	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Create function templates, overload function templates	3	3	3	3	1	1	0	0	1	0	1	3	3	3	1	0	Apply	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Understand and demonstrate the concept of data encapsulation, inheritance, polymorphism with virtual functions	3	3	3	3	2	2	0	0	3	0	3	3	3	3	1	0	Understand	Employability	
CO5	Demonstrate the concept of file operations, streams in C++ and various I/O manipulators	3	3	3	3	2	2	0	0	3	0	3	3	3	3	1	0	Demonstratre	Employability	

Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS( ) : (Data structures Lab)

CO No.	CO Statements	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Improve practical skills in designing and implementing basic linear data structure algorithms	3	3	3	3	2	3	0	0	0	0	1	3	3	3	1	0	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Improve practical skills in designing and implementing Non-linear data structure algorithms;	3	3	3	3	1	2	0	0	1	0	1	3	3	3	1	0	design	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Use Linear and Non-Linear data structures to solve relevant problems;	3	3	3	3	1	1	0	0	1	0	1	3	3	3	1	0	Implement	Skill Development	MSTs, ESE, Class/Quiz Tests
CO4	Choose appropriate Data Structure as applied to specific problem definition;	3	3	3	3	2	2	0	0	3	0	3	3	3	3	1	0	Apply	Skill Development	
CO5	Implement Various searching algorithms and become familiar with their design methods	3	3	3	3	2	2	0	0	3	0	3	3	3	3	1	0	Implement	Skill Development	

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I.K. Gujral Punjab Technical University, Kapurthala (Main Campus)
Department of Computer Science & Engineering

B. Tech CSE

4th Sem

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(BTES401-18) : (Computer Organisation and Architecture)

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC-BTES-401-18: Computer Organisation and Architecture)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/ analyse/ deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Understand functional block diagram of microprocessor	3	1	2	2	2	1			1	1		3	3		1		Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Apply instruction set for Writingassembly language programs	3	2	3	3	2		1		3	2	2	3	3	1	3	1	Apply	Employability	
CO3	Design a memory module and analyze its operation by interfacing with the CPU;	3	3	3	3	2				3	2	1	3	3	3	2		Design	Employability	
CO4	Classify hardwired and microprogrammed control units	3	1	2	2	3	1	1		1		1	3	3	1	1	1	Apply	Employability	
CO5	Understand the concept of pipelining and its performance metrics	3	3	3	3	3	1		1	3	2	1	3	3	2	3	1	Understand	Employability	

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partment Computer Science and Engineering

Program : B.Tech. (Computer Science and Engineering)

S(401-18) : Discrete Mathematics

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC-BTEC-502-18: Digital Signal Processing)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	To be able to express logical sentence in terms of predicates, quantifiers, and logical connectives	3	3	3	2		1	1		1				2				Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	To derive the solution for a given problem using deductive logic and prove the solution based on logical inference	3	3	3	3		1			2			1	2				Design	Employability	MSTs, ESE, Class/Quiz Tests
CO3	For a given a mathematical problem, classify its algebraic structure	3	3	3	2					1				1	1			Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	To evaluate Boolean functions and simplify expressions using the properties of Boolean algebra	3	3	3	3		2			2	2	1	1	1				Design	Employability	MSTs, ESE, Class/Quiz Tests
CO5	To develop the given problem as graph networks and solve with techniques of graph theory.	3	3	3	3	1	2	1	1	2	2	2	2	2	2	2	1	Design	Employability	MSTs, ESE, Class/Quiz Tests

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ırtment Computer Science and Engineering
rogram : B.Tech. (Computer Science and Engineering)
402-18) : Operating Systems

CO No.	CO Statements (UC-BTEC-502-18: Digital Signal Processing)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level (understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Explain basic operating system concepts such as overall architecture, system calls, user mode and kernel mode;	3	2	2	1	1	2	1		2	1	1	2	2	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Distinguish concepts related to processes, threads, process scheduling, race conditions and critical sections;	3	3	3	3	3	2	2	1	2	2	2	3	3	3	2	1	Design	Entrepreneurship/ Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Analyze and apply CPU scheduling algorithms, deadlock detection and prevention algorithms;	3	3	3	3	3	3	2	1	2	2	2	3	3	3	2	1	Design	Skill Development/ Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Examine and categorize various memory management techniques like caching, paging, segmentation, virtual memory, and thrashing;	3	3	3	3	3	3	1		2	2	2	3	3	2			Analyse	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Design and implement file management system;	3	3	3	3	3	3	2		2	2	2	3	3	3	2		Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO6	Appraise high-level operating systems concepts such as file systems, disk-scheduling algorithms and various file systems.	3	3	3	3	3	3	2	1	2	2	2	3	3	3	3	1	Understand	Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS 403-18 : (Design& Analysis of Algorithms)

CO No.	CO Statements	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO
CO1	For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms	3	3	1	3									3	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Explain when an algorithmic design situation calls for which design paradigm (greedy/ divide and conquer/backtrack etc.	3	3	3	3									3	2			Analyse	Employability	
CO3	Explain model for a given engineering problem, using tree or graph, and writethe corresponding algorithm to solve the problems	3	3	3	3	1	1							3	2			Analyse	Employability	
CO4	Demonstrate the ways to analyze approximation/randomized algorithms	3	3	3	3	2	1							3	2			Design	Employability	
CO5	Examine the necessity for NP class based problems and explain the use of heuristic techniques	3	3	3	3	2	2						2	3	2			Design	Employability	

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTES(402-18) : (Computer Organisation and Architecture Lab)

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC-BTES-402-18: Computer Organisation and Architecture Lab)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand / analyse/ deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Assemble personal compuer	3	2	2	3	2	2	2	1	3	1	1	3	3	1	2	1	Understand	Skill development	MSTs, ESE, Class/Quiz Tests
CO2	Implement the various assembly language problems for basic arithmetic and logical operations	3	3	3	3	2	1			3	2	3	3	3	1	1		implement	Skill development	MSTs, ESE, Class/Quiz Tests
CO3	Demonstrate the functioning of microprocessor/ microcontroller based systems with I/O interface	3	1	3	3	1	1			2	2	3	3	3	2	3	1	Demonstrate	Skill development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(404-18) :Operating Systems Lab

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC-BTEC-502-18: Digital Signal Processing)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/ analyse/ deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Understand and implement basic services and functionalities of the operating system;	3	3	3	3	3	2	2		3	2	3	3	3	3	2		Understand	Employability	MSTs, ESE, Practical Assignments Tests
CO2	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority;	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3	1	Analyse	Entrepreneurship/ Skill development	MSTs, ESE, Practical Assignments Tests
CO3	Implement commands for files and directories;	3	3	3	3	3	2	2		2	2	2	2	3	3	2		Design	Entrepreneurship/ Skill development	MSTs, ESE, Practical Assignments Tests
CO4	Understand and implement the concepts of shell programming;	3	2	3	2	3	3	3		2	3	2	3	3	3	2		Understand & Design	Entrepreneurship/ Skill development	MSTs, ESE, Practical Assignments Tests
CO5	Simulate file allocation and organization techniques;	3	3	3	3	3	2	2		3	2	2	2	2	2	2		Understand & Design	Entrepreneurship/ Skill development	MSTs, ESE, Practical Assignments Tests
CO6	Understand the concepts of deadlock in operating systems and implement them in multiprogramming system.	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3	1	Design	Entrepreneurship/ Skill development	MSTs, ESE, Practical Assignments Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS : (DAA Lab)

CO No.	CO Statements	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level (understand/ analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Design and implement complex problems with different techniques	3	3	3	3	3	2			2				3	3			design	Skill Development/Employability	MSTs, ESE, Class/Quiz Tests
CO2	Understand comparative performance of strategies and hence choose appropriate, to apply to specific problem definition;	3	3	3	3	3	2			2				3	3			understand	Skill Development/Employability	
CO3	Implement Various tree and graph based algorithms and become familiar with their design methods;	3	3	3	2	3	1							3	1	2		Apply	Skill Development/Employability	
CO4	Design and Implement heuristics for real world problems.	3	3	3	3	3	2							3	3	2		Design	Skill Development/Employability	

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Department of Computer Science & Engineering

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS-501-18 Database Management System

CO No.	CO Statements (UC-BTCS-501-18: Database Management System)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	write relational algebra expressions for a query and optimize the Developed expressions	1	3	3	2	0	0	0	0	3	3	2	2	3	2	1	0	understand	employability	MSTs, ESE, Class/Quiz Tests
CO2	design the databases using ER method and normalization.	1	3	3	2	2	1	1	1	3	3	2	2	3	3	3	1	Analyse	enterpreneurship	MSTs, ESE, Class/Quiz Tests
CO3	construct the SQL queries for Open source and Commercial DBMS-MYSQL, ORACLE, and DB2.	1	2	2	2	2	1	1	1	2	2	2	2	3	2	3	1	design	enterpreneurship	MSTs, ESE, Class/Quiz Tests
CO4	determine the transaction atomicity, consistency, isolation, and durability	1	2	1	1	1	0	0	0	3	3	2	2	3	1	1	0	understand	employability	MSTs, ESE, Class/Quiz Tests
CO5	Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling	1	2	2	2	1	1	1	1	3	3	2	2	3	2	2	1	design	employability	MSTs, ESE, Class/Quiz Tests

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ırtment Computer Science and Engineering
rogram : B.Tech. (Computer Science and Engineering)
502-18) :Formal Language & Automata Theory

CO No.	CO Statements (UC-BTEC-502-18: Digital Signal Processing)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Write a formal notation for strings, languages and machines.	3	2	2	1	1				1			2	1	1			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Design finite automata to accept a set of strings of a language.	3	3	3	2	1	1	1		1		1	2	2	2			Design	Employability	MSTs, ESE, Class/Quiz Tests
CO3	For a given language determine whether the given language is regular or not.	3	3	3	3	2	2	1	1	2	1	2	2	3	3	2	1	Analyse	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Design context free grammars to generate strings of context free language.	3	2	3	2	1		1		2		2	1	2	2	2		Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars	3	3	3	3	2	1	2	1	2	1	1	3	3	3	2	1	DEsign	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO6	Write the hierarchy of formal languages, grammars and machines.	2	1	1	1		1	1			1	1	1	1				Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO7	Distinguish between computability and non-computability and Decidability and undecidability.	2	1	1	1		1	1		1		1	1	2	1			Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(503-18) : Software Engineering

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problem	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC-BTEC-502-18 (Software Engineering)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	Students should be able to identify the need for engineering approach to software development and various processes of requirements analysis for software engineering problems.	3	2	2	2	1	2	2	2	2	3	3	3	3	2		2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Analyze various software engineering models and apply methods for design and development of software projects.	3	3	3	2	3	3	2	1	3	2	3	3	3	2	3	1	Analyse	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Work with various techniques, metrics and strategies for testing software projects.	3	3	3	2	3	2	1	1	2	2	2	3	3	3	2	1	Create	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Identify and apply the principles, processes and main knowledge areas for Software Project Management	3	3	3	3	3	3	2	1	3	1	1	3	3	3	3	1	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Proficiently apply standards, CASE tools and techniques for engineering software projects	3	3	3	3	3	3	3		2	2	2	3	3	3	3		Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS 504 -18UC (Computer Network)

CO No.	CO Statements: BTCS 504 -18UC (Computer Network)	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Explain the functions of the different layer of the OSI Protocol	3	3	3	2	3	3	3	2	2	3	1	3	3	2	2	2	2	2	MSTs, ESE, Class/Quiz Tests
CO2	Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs)	3	2	3	2	3	3	3	2	3	3	2	3	3	3	1	1	2	2	MSTs, ESE, Class/Quiz Tests
CO3	Develop the network programming for a given problem related TCP/IP protocol	3	3	3	3	3	3	3	2	3	3	1	3	3	2	2	1	3	3	MSTs, ESE, Class/Quiz Tests
CO4	Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.	3	3	3	3	3	3	3	3		3	1	3	3	3	2	2	2	3	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering) .
BTCS 512-18 : (Web and Open Source Technologies Lab)

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	develop web based application using suitable client side and server side web technologies	3	2	2	3	3	3	2	2	3	2	3	3	3	3	3	2	3	3	MSTs, ESE, Class/Quiz Tests
CO2	develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management	3	3	3	3	2	1	1	1	3	2	3	3	3	3	3	2	3	3	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(612-18UC) Programming in Python Lab

CO No.	CO Statements (Programming in Python Lab)	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Write, Test and Debug Python Programs	3	3	3	3	3	3	2	1	1	2	2	1	2	1	2		Test and Evaulate	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Implement Conditionals and Loops for Python Programs	3	3	2	3	2	3	2	2	1	1	1	3	2	2	2		Implement	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Use functions and represent Compound data using Lists, Tuples and Dictionaries	3	2	2	3	2	3	2	1	2	1	2	2	3	1	2	1	Apply	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Read and write data from & to files in Python and develop Application using Pygame	3	3	3	3	3	3	1	2	1	2	1	2	2	2	2		Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS : Mobile Application Development

CO No.	CO Statements	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problem	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Describe those aspects of mobile programming that make it unique from programming for other platforms	3	3	3	3	3				2				3	3			design	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Critique mobile applications on their design pros and cons	3	3	3	3	3	2			2				3	3			understand	Entrpreneurship	
CO3	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,	3	3	3	2	3	1			2				3	1	2		Apply	Employability	
CO4	Program mobile applications for the Android operating system that use basic and advanced phone features,	3	3	3	3	3	2			2				3	3	2		Design	Employability	
CO5	Deploy applications to the Android marketplace for distribution	3	3	3	3	3	2			2				3	3	2		Design	Employability	

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) Mobile Application Development Lab

CO No.	CO Statements	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Demonstrate the android features and create, develop using android	3	3	3	3	3	2	2	1	3	3	3	3	3	3	3	2	Design	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Demonstrate and Understanding anatomy of an Android application	3	3	3	3	3	3	3		3	3	2	3	3	3	3	1	Understand	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Illustrate the android wifi features and advance android development	2	1	1	2	1	2	1	1	3	3	1	2	1	2	1	1	Analyse	Skill Development	MSTs, ESE, Class/Quiz Tests
CO4	Develop an application using basic graphical primitives and databases	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	Design	Skill Development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) Internet of Things

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	To understand internet of Things and its hardware and software components	1	1	1	2	1	1	1		1	3	1	3	2	1	1		Understand	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	To develop an Interface I/O devices, sensors & communication modules	3	3	3	3	3	3	2		3	3	2	3	3	2	2	1	Develop	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	To remotely monitor data and control devices	3	3	3	3	3	3	1	1	3	3	2	3	3	3	1	1	Analyse	Skill Development	MSTs, ESE, Class/Quiz Tests
CO4	To develop real life IoT based projects	3	2	2	3	3	3	3		3	1	2	3	3	3	3	1	Develop	Skill Development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS : (Computer Graphics Lab)

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.	3	3	3	3	3	2			2				3	3	2		design	Employability & Entrpreneurship	MSTs, ESE, Class/Quiz Tests
CO2	To demonstrate the importance of viewing and projections.	3	3	3	2	3				2				3	2			understand	Entrpreneurship	
CO3	To apply the fundamentals of animation, virtual reality and its related technologies	3	3	3	3	3				2				3	3	2		Apply	Employability & Entrpreneurship	
CO4	To implement a typical graphics pipeline	3	3	3	3	3				2				3	2			Design	Employability	

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS-505-18 Database Management System Lab

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values					
CO No.	**CO Statements (UC-BTCS-505-18: Database Management System Lab)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**		
CO1	retrieve data from relational databases using SQL	1	3	2	2	1	1	1	1	3	2	3	3	2	2	2	1	Analyse	employability	Practicals	Viva	Assignments
CO2	implement generation of tables using datatypes	1	2	2	2	1	1	1	1	3	3	3	3	2	2	2	1	Design	enterpreneurship	Practicals	Viva	Assignments
CO3	design and execute the various data manipulation queries.	1	2	2	2	1	1	1	1	3	2	3	3	2	2	2	1	Design	employability	Practicals	Viva	Assignments
CO4	execute triggers, cursors, stored procedures etc.	1	3	3	3	2	1	1	1	3	3	3	3	2	2	2	1	Design	enterpreneurship	Practicals	Viva	Assignments

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IKG PTU Main Campus
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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS 507 -18UC (Computer Network Lab)

CO No.	CO Statements	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Know about the various networking devices, tools and also understand the implementation of network topologies.	3	1	3	2	3	3	3	2	2	3	1	3	3	3	2	2	3	3	MSTs, ESE, Class/Quiz Tests
CO2	Create various networking cables and know how to test these cables.	3		2	2	3	3	3	1	2	3	1	3	3	2	2	1	2	2	MSTs, ESE, Class/Quiz Tests
CO3	Create and configure networks in packet tracer tool using various network devices and topologies.	3	1	3	1	3	3	3	1	2	3	2	3	3	3	2	1	3	2	MSTs, ESE, Class/Quiz Tests
CO4	Configure routers using various router configuration commands.	3		2	2	3	3	3	1	2	3	3	3	3	2	1	1	3	3	MSTs, ESE, Class/Quiz Tests

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I.K. Gujral Punjab Technical University, Kapurthala (Main Campus)
Department of Computer Science & Engineering

B. Tech CSE

6thSem

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(601-18UC) : Compiler Design

CO No.	CO Statements	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level (understand/ analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Understand the major phases of compilation including front-end and back-end.	3	1	1	1	3	2	2		2	1	1	1	2	1			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Develop the parsers and experiment the knowledge of different parsers design	3	3	3	2	3	3	2	1	3	1	2	2	3	2	3	1	Create	Skill Development &Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Construct the intermediate code representations and generation	3	2	2	2	2	2	1	1	2		2	2	3	2	2	1	Create	Skill Development &Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Convert source code for a novel language into machine code for a novel computer	3	3	3	3	3	3	2	1	3	1	1	3	3	3	3	1	Create	Skill Development &Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Apply for various optimization techniques for dataflow analysis	3	2	1	2	2	3	3		2	2	2	2	2	2	3		Create	Skill Development &Entrepreneurship	MSTs, ESE, Class/Quiz Tests

Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
Artificial Intelligence

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	Understand different types of AI agents.	3	2	2	2	1	1	1		1	2	2	2	2	1			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Develop different types of various AI search algorithms.	3	3	3	3	3	2	2	1	2	2	2	3	3	3	3	1	Create	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Construct simple knowledge-based systems and to apply knowledge representation.	3	3	3	3	3	2	2		2	2	2	3	3	3	1		Design	Skill Dvelopment &Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Convert intermediate representation in contest to understand learning.	3	2	2	2	3	3	2	1	2	3	3	3	3	3	3		Understand and Design	Skill Dvelopment &Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Apply for various techniques for Expert Systems.	3	2	2	3	3	2	2		2	2	3	3	3	3	2		Understand and Design	Skill Dvelopment &Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering

Program : B.Tech. (Computer Science and Engineering)

BTCS605-18UC :Artificial Intelligence Laboratory

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/analyse/deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Explain artificial intelligence, its characteristics and its application areas.	3	2	2	1	2	2	3	2	2	2	2	3	3	3	1	2	Understand	Employability	Practical Assignments
CO2	Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.	3	3	3	3	3	2	2	2	3	2	2	3	3	3	3	2	Design	Skill Development &Entrepreneurship	Practical Assignments
CO3	Select and apply appropriate algorithms and AI techniques to solve complex problems.	3	3	3	3	3	3	2		3	3	3	3	3	3	3		Design	Entrepreneurship	Practical Assignments
CO4	Design and develop an expert system by using appropriate tools and techniques.	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	Design	Entrepreneurship	Practical Assignments

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS BTCS606-18UC (Network Security and Cryptography)

CO No.	CO Statements	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/ analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Understand real time systems for identifying security threats.	3	3	2	2	3	3	2	1	2	3		2	3	3	2	1	Understand	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Compare public and private cryptographic algorithms and make use of the same for encryption and decryption of messages.	3	1	3	3	3	3	3	1	2	3		3	3	2	2	1	Understand	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Design confidential systems with minimum possible threats.	3	2	3	3	3	3	3	1	2	3	1	3	3	3	2	1	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Apply both cryptography and hashing to create digital signatures and certificates for achieving integrity	3		3	3	3	3	3	1	2	3		3	3	2	2	1	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS BTCS609-18UC (Network Security and Cryptography Lab)

CO No.	CO Statements	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Develop and implement a java interface for encryption and decryption algorithms i.e., AES, MD5 and RSA algorithms	3	3	2	2	3	3	2	1	2	3		2	3	3	2	1	Implement	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Identify the security issues in the network and resolve it.	3	1	3	3	3	3	3	1	2	3		3	3	2	2	1	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Analyse the vulnerabilities in any computing system and hence be able to design a security solution.	3	2	3	3	3	3	3	1	2	3	1	3	3	3	2	1	Design	Skill Development	MSTs, ESE, Class/Quiz Tests

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Kapurthala

Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS : (Data minng Lab)

CO No.	CO Statements	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO
CO1	Apply data cleaning, pre-processing and integration on data sets	3		3	3	3				2				3		2		Apply	Skill development	MSTs, ESE, Class/Quiz Tests
CO2	Execute algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction	3	3	3	3	3	3			2				3		2		Design	Skill development	
CO3	Extract knowledge using data mining techniques on data sets	3	3	3	3	3	3		1	2				3			1	Apply	Skill development	
CO4	Explore recent trends in data mining such as web mining, spatial-temporal mining	3	2	3	3	3				2		1		3	2			Design	Skill development	

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS-612-18 Cloud Computing Lab

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC-: BTCS-612-18 Cloud Computing Lab)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/analyse/ deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Use the cloud tool kits.	1	1	2	1	3	1	1	1	1	1	1	3	3	1	1	1	Implement	Skill Development	Practicals
CO2	Implement applications on the Cloud	1	3	3	3	3	2	2	1	3	3	3	3	3	2	3	1	Apply	Skill Development	Practicals
CO3	To install cloud computing environments	1	1	2	1	3	1	1	1	2	1	2	3	3	1	1	1	Apply	Skill Development	Practicals
CO4	To develop any one type of cloud	1	2	3	1	3	2	2	1	3	3	2	3	3	2	3	1	Apply	Skill Development	Practicals
CO5	To explore future trends of cloud computing	1	1	2	2	3	2	2	1	3	3	2	3	2	2	3	1	Design	Skill Development	Practicals

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Department of Computer Science & Engineering
IKG PTU Main Campus
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Department Computer Science and Engineering

Program : B.Tech. (Computer Science and Engineering)

BTCS(612-18UC) : Information Theory and Coding

CO No.	CO Statements	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Understand various entropies and Define the information theories.	3	2	2	2	1	1	1		1	2	2	1	2	1			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Apply source coding techniques	3	3	3	3	3	2	2	1	2	2	2	3	3	3	2	1	Create	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Compute the capacity of various types of channels.	3	3	3	2	3	2	2		2	1	2	2	3	2	1		Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Understand and Construct codes using different error control techniques.	3	2	2	2	3	3	2	1	2	2	2	3	3	3	3		Understand and Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Apply various coding schemes for text, speech and audio.	3	2	3	3	3	2	2		2	2	3	3	3	3	2		Understand and Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering

Program : B.Tech. (Computer Science and Engineering)

BTCS615-18UC : Information Theory and Coding Lab

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/analyse/ deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Compare various capacity reduction based coding techniques for image and video type of data.	3	3	2	2	3	2	3		3	3	3	3	3	3	3		Understand & Design	Skill Development	Practical Assignments
CO2	Implement various error control techniques for Convolutional codes	3	3	3	3	3	2	2	2	3	2	2	3	3	3	3	2	Understand & Design	Skill Development	Practical Assignments
CO3	Illustrate various security oriented coding techniques for Block codes	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	Understand & Design	Skill Development	Practical Assignments
CO4	calculate entropy, joint entropy, relative entropy, conditional entropy, and channel capacity of a system	3	3	3	3	3	3	3		3	3	3	3	3	3	3		Understand & Design	Skill Development	Practical Assignments

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) : BTCS-617-18 Data Science Lab

CO No.	CO Statements (UC-BTCS-617-18 Data Science Lab)	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level(understand/analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO
CO1	Plan the projects in the domain of data science.	1	3	2	3	2	2	1	1	3	3	3	3	3	3	3	1	Analyze	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Use data analytics tools towards problem solving and solution analysis.	1	1	3	1	3	1	1	1	1	1	2	3	3	2	3	1	Knowledge	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Apply Mathematical sciences and recent technologies in Computer Science to solve real life problems	3	3	3	3	1	2	1	1	2	3	3	3	3	3	3	1	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests
CO4	Apply data science concepts and methods to solve problems in real-world context.	3	3	3	3	1	2	1	1	2	3	3	3	3	2	3	1	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS 614-18UC : (Soft Computing)

CO No.	CO Statements	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problem	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO
CO1	Understand various soft computing concepts for practical applications	3	2	1	3									3	1	2		understand	Skill development	MSTs, ESE, Class/Quiz Tests
CO2	Design suitable neural network for real time problems	3	2	3	3	2	1							3	2	2		Design	Skill development	
CO3	Construct fuzzy rules and reasoning to develop decision making and expert system	3	2	3	3	2	2							3	2	2		Apply	Skill development	
CO4	Apply the importance of optimization techniques and genetic programming	3	2	3	3	2	1							3	2	3		Apply	Skill development	
CO5	Review the various hybrid soft computing techniques and apply in real time problems	3	2	3	3	2	2							3	2	2		Design	Skill development	

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(612-18UC) Soft Computing Lab

	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (Soft Computing Lab)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Reveal different applications of these model+B7:B11s to solve engineering and other problems.	3	3	3	3	3	3	2	1	1	2	2	1	2	2			Estimate	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems	3	3	3	3	3	3	2	1	1	2	2	3	3	2	1	1	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Apply genetic algorithms to combinatorial optimization problems	3	3	3	3	3	3	2	1	2	1	2	2	3	2	1		Design	Skill Development	MSTs, ESE, Class/Quiz Tests
CO4	Effectively use existing software tools to solve real problems using a soft computing approach	3	3	3	3	3	3	1	1	1	2	2	3	3	2	1	1	Compute	Skill Development	MSTs, ESE, Class/Quiz Tests
CO5	Evaluate and compare solutions by various soft computing approaches for a given problem.	3	3	3	3	3	3	2	1	1	2	3	3	3	2	1		Evaluate	Skill Development	MSTs, ESE, Class/Quiz Tests

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Department of Computer Science & Engineering

B. Tech CSE

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)

BTCS(type code) : BTCS-619-18 Machine Learning Lab

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements (UC619-18 Machine Learning Lab)**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level(understand/analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	**Solve problems using** the machine learning models.	1	2	2	2	3	1	1	1	2	1	2	3	2	2	2	1	Apply	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Apply various reinforcement algorithms to solve real time complex problems.	2	3	2	2	3	1	1	1	2	2	2	3	3	3	2	1	Apply	Enterpreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Identify the core components of deep neural network model.	1	2	2	1	3	1	1	1	2	1	2	3	2	1	1	1	Knowledge	Employability	MSTs, ESE, Class/Quiz Tests
CO4	*Implement* unsupervised models through programming language.	1	2	2	2	3	1	1	1	2	1	2	3	2	2	2	1	Apply	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS(type code) Speech and Natural Language Processing

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on**	**Assessment Tools to Measure Attainment of CO**
CO1	Describe the fundamental concepts and techniques of natural language processing.	3	2	3	2	3	3	1	1	3	3	2	3	2	2	3	1	Understand	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each.	3	3	3	3	3	3	1		3	3	2	3	1	2	2	1	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions.	2	3	3	3	3	3	1		3	3	2	2	2	3	2		Design	Skill Development	MSTs, ESE, Class/Quiz Tests
CO4	Analyze large volume text data generated from a range of real-world applications.	2	1	1	2	3	2	2	1	2	2	2	2	1	2	2	1	Understand	Skill Development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS 713-18UC :Block chain Technology Lab

CO No.	CO Statements	PO-a Engineering Knowledge	PO-b Problem Analysis	PO-c Design/development of solutions	PO-d Conduct investigations of complex problems	PO-e Modern tool usage	PO-f The engineer and society	PO-g Environment and sustainability	PO-h Ethics	PO-i Individual and team work	PO-j Communication	PO-k Project management and finance	PO-l Life-long Learning	PSO-m Honing Domain Knowledge	PSO-n Innovation and design	PSO-o Entrepreneurship Skills	PSO-p Ethical values	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Interact with a blockchain system by sending and reading transactions.	3	3	2	2	3	3	3	2	3	2	2	3	3	3	2	2	Understand	Skill Development	Practical Assignments
CO2	Design, build, and deploy a distributed application.	3	3	3	3	3	3	3		3	3	3	3	3	3	3		Design	Skill Development	Practical Assignments
CO3	Evaluate security, privacy, and efficiency of a given blockchain system.	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	Design	Skill Development	Practical Assignments

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS 614-18UC : (Software Defined Networks)

		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problem	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO No.	**CO Statements**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PO-k**	**PO-l**	**PSO-m**	**PSO-n**	**PSO-o**	**PSO-p**	**Learning Level (understand/ analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	To define and understand terminology involved in the field of software defined networking	3												3				understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	To describe software defined architecture and open flow protocol for communication between controller and switches	3		3										3				Design	Employability	
CO3	To provide an overview and comparison of various SDN controllers	3				1								3				Apply	Employability	
CO4	To design topologies using Mininet and various APIs	3	2	3		1	1					1		3	2			Design	Employability	
CO5	To develop various applications and protocols for SDN architecture	3	2	3		1								3	2			Design	Employability	
CO6	To identify and analyse various security threats in SDN based networks	3	2				1		1					3			1	identify	Employability	

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS712-18UC : (Digital Image Processing)

CO No	CO Statements (UC-BTEC-502-18: Digital Signal Processing)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level (understand/ analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	Understand the basic concepts of DIP	2	1	2	1	1	2	3		1		1	3	3	1	1		Understand	Skill Development	MSTs, ESE, Class/Quiz Tests
CO2	Improve the quality of digital images	3	2	3	3	2	1			1	1	1	2	3	3	1		Apply	Skill Development	MSTs, ESE, Class/Quiz Tests
CO3	Understand and De-noise Digital Images	2	3	3	2	1	1	1		1			2	3	3	1	1	Understand	Skill Development	MSTs, ESE, Class/Quiz Tests
CO4	Segment digital images and extract various features from digital images	2	2	2	2	3	1		1	1	1	1	2	3	2	1	1	Apply	Skill Development	MSTs, ESE, Class/Quiz Tests
CO5	Understand various image compression techniques and apply such techniques to compress digital images for reducing the sizes of digital images.	3	2	3	2	3	2	1		3	1	2	3	3	2	2		Understand	Skill Development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program : B.Tech. (Computer Science and Engineering)
BTCS715-18UC) : (Digital Image Processing Lab)

CO No	CO Statements	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning	Honing Domain Knowledge	Innovation and design	Entrepreneurship Skills	Ethical values			
CO1	develop any image processing application.	2	2	3	3	3	3	2	2	2	2	2	3	3	3	3	2	implement	Skil Development	MSTs, ESE, Class/Quiz Tests
CO2	understand the rapid advances in Machine vision.	2	2	3	3	3	2	2	1	3	3	3	3	3	3	3	2	Apply	Skil Development	MSTs, ESE, Class/Quiz Tests
CO3	learn different techniques employed for the enhancement of images.	3	2	3	3	3	3	3	2	2	2	3	3	3	2	3	2	Apply	Skil Development	MSTs, ESE, Class/Quiz Tests
CO4	Perform image enhancement techniques in spatial and frequency domain	2	3	3	3	2	2	3	1	2	2	3	3	3	3	3	2	Design	Skil Development	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1963 **Digital Image Processing**

CO No.	CO Statements (PC- PGCA1963 : Digital Image Processing)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of Complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO			
CO1	Discuss the need of various image transforms along with properties							3				3	3	3	2	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests			
CO2	Learn different techniques employed for the enhancement of images			3	3			3						3	2	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests			
CO3	Describe the rapid advances in Machine vision	3						3				3	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests			
CO4	Analyze images in multiresolution environment	3		3	3		3	3					3	3	3	3	3	Analyse	Employability	MSTs, ESE, Class/Quiz Tests			
CO5	Evaluate image compression techniques	3						3		3		3		3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1964 **Digital Image Processing Laboratory**

CO No.	CO Statements (PC- PGCA1964: Digital Image Processing Labora	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply Knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Implement the various operations which can be performed on images.				3	3		3				3	3	3	2	2	2	Design	Employability and Entrepreneurship	Practical Assignments				
CO2	Apply filters on images as per the requirement	3		3		3		3						3	2	2	2	Design	Employability and Entrepreneurship	Practical Assignments				
CO3	Implement different techniques employed for the enhancement of images	3			3	3		3				3	3	3	3	3	3	Design	Employability and Entrepreneurship	Practical Assignments				
CO4	Implement image compression	3	3	3	3	3	3	3						3	3	3	3	Design	Employability and Entrepreneurship	Practical Assignments				
CO5	Develop an Image Processing Application	2		3				3				3	3	2	3	2	3	Design	Employability and Entrepreneurship					

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1965 **NLP and Speech Recognition**

CO No.	CO Statements (PC- PGCA1965 : NLP and Speech Recognition)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Discuss the fundamental concepts of natural language processing		3		3	3		3				3	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO2	Explain text normalization, use of edit distance, and regular expressions	3			3	3		3						3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO3	Implement Naïve bayes and sentiment classification algorithms		3	3		3	3				3	3	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO4	Familiarize with chatbots and phonetics	3		3	3					3	3			3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO5	Describe the concept of speech recognition and text to speech conversion	3	3	3	3	3		3		3		3	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1967 IOT & Blockchain Technology

CO No.	CO Statements (PC- PGCA1967 : IOT & Blockchain Technology)	PO-a (Computational Knowledge)	PO-b (Problem Analysis)	PO-c (Design /Development of Solutions)	PO-d (Conduct investigations of complex Computing problems)	PO-e (Modern Tool Usage)	PO-f (Professional Ethics)	PO-g (Life-long Learning)	PO-h (Project management and finance)	PO-i (Communication Efficacy)	PO-j (Societal and Environmental Concern)	PO-k (Individual and Team Work)	PO-l (Innovation and Entrepreneurship)	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Discuss the terminology and enabling technologies of IoT and Blockchain						3	2	3			3	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO2	Identify various element of IoT.	3		3				3	3			3		3			3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO3	Enumerate the steps involved in IoT system design methodology		3	2			2	3				3			3	3		Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO4	Describe the working of bit coin crypto currency	3	3	3	3			3	1				3	3	3	3	3	Understand And Design	Employability	MSTs, ESE, Class/Quiz Tests				
CO5	List domain specific applications of IoT and Blockchain				2				2				2	2	2	2	2	Understand And Design	Employability					

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1966 **NLP and Speech Recognition Laboratory**

CO No.	CO Statements (PC- PGCA1966 : NLP and Speech Recognition La	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of Complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Develop knowledge of various learning models of data	3	3		3	3		3				3			3	3	3	Understand	Employability	Practical Assignments				
CO2	Analyze performance of various learning algorithms	3	3	3				3					3	3	3	3		Understand	Employability	Practical Assignments				
CO3	Evaluate models generated from data	3	3	3	3		3	3				3	3	3	3		3	Understand	Employability	Practical Assignments				
CO4	Apply the algorithms to a real-world problems	3	3	3		3		3					3			3	3	Understand and Design	Employability	Practical Assignments				
CO5	Optimize the models learned and report on the expected accuracy that can be achieved by applying the models	3	3	3	3	3		3				3	3	3	3	3	3	Understand and Design	Employability	Practical Assignments				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1968 IOT & Blockchain Technology Laboratory

CO No.	CO Statements (PC- PGCA1968 : IOT & Blockchain Technology La	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Use IoT sensors and remotely monitor data and control devices.		3		2			2	2					3		3		Understand And Design	Employability	Practical Assignmets				
CO2	Develop real life IoT based projects.	3	3		3	3		3				2	3		3		3	Understand And Design	Entrepreneurship	Practical Assignmets				
CO3	Discuss blockchain technology and develop blockchain based solutions.			3	2			3						2		3	3	Understand And Design	Entrepreneurship	Practical Assignmets				
CO4	Deploy IoT based blockchain applications for on-premise and cloud based architecture.	3	3	2	3	2		3				3	3	3	3	3		Understand And Design	Entrepreneurship	Practical Assignmets				
CO5	Create docker based application			3		3		3				2	2	2	2	3	2	Understand And Design	Employability					

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA-B1 Computer Programming using C

CO No.	CO Statements (PC- PGCA-B1 : Computer Programming using C)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Express the logical flow used in Programming.	3	3					3		2				2	1	3	3	Understa	Employa	MSTs, ESE, Class/Quiz Tests	
CO2	Design algorithms for solving various real life problems	3	3	3	3			3					3	3	3	3	3	Understa	Employab	MSTs, ESE, Class/Quiz Tests	
CO3	Implement programs using C .	3	3	3	3	3		3				3	3	3	2	3	3	Understa	Employab	MSTs, ESE, Class/Quiz Tests	
CO4	Choose the right data type and statements for programs.	2		3	1	1	1	3				2	3	3	3	3	1	Understa	Employability		
CO5	Explain various concepts of C programming language.	3		1	1	2	1	3					3	3	3	3	2	Understa	Employability		

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Department: Computer Science and Engineering
Program: Master of Computer Applications (MCA)

PGCA1937 **Cloud Computing**

CO No.	CO Statements (PC- PGCA1937 : Cloud Computing)	PO-a (Computational Knowledge)	PO-b (Problem Analysis)	PO-c (Design /Development of Solutions)	PO-d (Conduct investigations of complex Computing problems)	PO-e (Modern Tool Usage)	PO-f (Professional Ethics)	PO-g (Life-long Learning)	PO-h (Project management and finance)	PO-i (Communication Efficacy)	PO-j (Societal and Environmental Concern)	PO-k (Individual and Team Work)	PO-l (Intervention and Entrepreneurship)	PSO-m: Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n: Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o: Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p: Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Discuss the basic concept and importance of cloud computing.	3					3	3	3				3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Explain the process of migrating to a cloud solution for different applications.	3		3				3	3			3	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Compare and evaluate the virtualization technologies.	3	3	3	3								3	3			3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Monitor and manage the cloud resources, applications and data while addressing the security concerns.				3		3		3				3	3	3			Understand And Design	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Use cloud solutions offered by industry leaders for various applications.	3	3	2	3		3	3					3	3	3	3		Understand And Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
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PGCA 1938 **Cloud Computing Laboratory**

CO No.	CO Statements (PC- PGCA 1938: Cloud Computing Laboratory)	PO-a (Computational Knowledge)	PO-b (Problem Analysis)	PO-c (Design /Development of Solutions)	PO-d (Conduct investigations of complex Computing problems)	PO-e (Modern Tool Usage)	PO-f (Professional Ethics)	PO-g (Life-long Learning)	PO-h (Project management and finance)	PO-i (Communication Efficacy)	PO-j (Societal and Environmental Concern)	PO-k (Individual and Team Work)	PO-l (Innovation and Entrepreneurship)	PSO-m (Understand and apply knowledge on analysis, design and development of applications in the computing discipline.)	PSO-n (Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.)	PSO-o (Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.)	PSO-p (Develop techniques to enhance ability for lifelong learning.)	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Create applications for SaaS.	3	3	3		3		3	2					3	3	3	3	Understand	Employability	Practical/ Assignments				
CO2	Develop cloud applications using popular cloud platforms.	3			3	3	3	3	3					2	3	3	2	Understand And Design	Entrepreneurship	Practical/ Assignments				
CO3	Create virtual machines on the cloud.	3	3	3	3	3	3	3	2			3	3	3	3	3	3	Understand And Design	Entrepreneurship	Practical/ Assignments				
CO4	Implement cloud storage management tasks.	3	3	3				3	3					3				Understand And Design	Employability					
CO5	Develop private cloud				3	3		3	1			2		2	2	2	3	Understand And Design	Employability					

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1933 **Mobile Application Development**

CO No.	CO Statements (PC- PGCA1933 : Mobile Application Development)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO	
CO1	Define framework of mobile application development							3	3		3			3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests	
CO2	comment upon the building blocks of mobile computing	3		3				3	3		3	3	3	3	3	3	3	Understand And Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests	
CO3	test the mobile applications		3		3			3		3				3	3	3	3	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests	
CO4	Compare development environment of different operating systems for mobile applicatio	3	3	3	3			3		3	3	3	3	3	3	3	3	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests	
CO5	Write programs for basic mobile applications	2							3	2			3								

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1934 **Mobile Application Development Laboratory**

CO No.	CO Statements (PC- PGCA1934 : Mobile Application Development	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Prepare environment for coding and running mobile applicatiosns	3		3				3	3					3	3	3	3	Understand	Employability	Practical Assignments				
CO2	Develop mobile applications using GUI and Layouts	3	3	3	3	3		3					3	3	3	3	2	Understand And Design	Entrepreneurship	Practical Assignments				
CO3	Develop mobile applications for different mobile operating systems.	3	3	3		3		3				3		3		3		Design	Entrepreneurship	Practical Assignments				
CO4	Test Mobile Applications	3				3		3	3		3		3		3	3	3	Design and Analyse	Entrepreneurship	Practical Assignments				
CO5	Implement database connectivity with mobile applications.	3		3		3								3		3	2							

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1935 **Simulation & Modelling**

CO No.	CO Statements (PG- PGCA1935 : Simulation & Modelling)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Identify the paradigms and approaches used to design the simulation.	3	3		3			3	3					3	3	3	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO2	Compare different types of simulation, techniques and methods.	3			3		3		3				3	3		3	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO3	Apply concepts of computer simulation for types of inputs, system models, output behavior and performance estimation		3	3			3	3	2					3	3	3	2	Design	Employability	MSTs, ESE, Class/Quiz Tests				
CO4	Test the goodness of a simulation by analyzing the simulated data.	3	3		3			3	3				3	3	3	3	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO5	Highlight features of different simulation modelling softwares			2									3	3	2	2	2	Understand	Employability					

Computational Knowledge	Problem Analysis	Design /Development of Solutions	Conduct investigations of complex Computing problems	Modern Tool Usage	Professional Ethics	Life-long Learning	Project management and finance	Communication Efficacy	Societal and Environmental Concern	Individual and Team Work	Innovation and Entrepreneurship	Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	Develop techniques to enhance ability for lifelong learning.
PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1936 **Simulation & Modelling Laboratory**

CO No.	CO Statements (PC- PGCA1936: Simulation & Modelling Laborato	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Use software tools for modelling and analysis of mathematical concepts for engineering application.		3	3		3								3	3	3	3	Understand And Create	Entrepreneurship	Practical Assignments				
CO2	Simulate discrete problems using queuing systems.			3	3	3		3	3				3	3	3	3	3	Understand And Design	Entrepreneurship	Practical Assignments				
CO3	Model and analyze simple engineering concepts and its importance in engineering applications.	3				2		3						3	3	3	3	Design and Analyse	Entrepreneurship	Practical Assignments				
CO4	Apply simulation software to construct and execute goal-driven system models.	3	3	3	3	3		3	3				3	3	3	3	3	Understand And Design	Entrepreneurship	Practical Assignments				
CO5	Create Simulation Projects	3	3	3	2	3							2	3	2	2	3	Understand And Design	Entrepreneurship					

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1921 **E-Commerce & Digital Marketing**

CO No.	CO Statements (PC- PGCA1921 : E-Commerce & Digital Marketing	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Discuss the scope of ecommerce.			3	3			3	3		3		3	3	3	3		Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO2	Explain payment modes used in ecommerce today.			3	3			3	3		3		3	3	3	3		Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO3	Execute a comprehensive digital marketing strategy and plan			3				3			3	3	3	3		3	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO4	Describe the use digital marketing for multiple goals within a larger marketing and/or media strategy.							3	3		3	3		2	3	2		Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO5	List the major digital marketing channels.	3		3	3			3			3		3	3	3	3	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA 1974 **e-Commerce and Digital Marketing Laboratory**

CO No.	CO Statements (PG- PGCA 1974 : e-Commerce and Digital Market	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Implementat E-Commerce applicatians.	3	3		3	3		3	3		2		3	3	3	3	3	Understand	Employability	Practical Assignments				
CO2	Develop digital marketing strategy and plan			3	3	3		3	3		3		3	3	3	3	3	Understind and Design	Entrepreneurship	Practical Assignments				
CO3	Designe Ifective digital and social media strategies			3	3	3	3	3	2		3	3	3	3	3	3	3	Design	Entrepreneurship	Practical Assignments				
CO4	Discuss social, and socially issues concerning the digital marketing and e-commerce		3					3			3	3	2	E	3	3	3	Design	Entrepreneurship					
CO5	Implement a project for E-Commerce and Digital Marketing		2	2		2		3			3			2	2	1	2	Understand	Entrepreneurship					

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Program Master of Computer Applications (MCA)

PGCA1931 **Software Testing & Quality Assurance**

CO No.	CO Statements (PC- PGCA1931: Software Testing & Quality Assu	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p
CO1	Explain various approaches to software testing and quality assurance in							1				2		3	3	3	3
CO2	Create test strategies, design test cases, prioritize and execute them		3	3	3		3	1	3		3	2	3			3	
CO3	Identify various risks involved with software projects and build risk			3			3				3	3		3		3	3
CO4	Plan software management and configuration activities			3	3		2	1	3			3		3			3
CO5	Dicuss the risk management involved in software development		2					1	1			3		2	2	2	2

Learning Level(understand/analysel design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
Understand	Employability	MSTs, ESE, Class/Quiz Tests
Understand and Create	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
Understand and Create	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
Create	Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1975 Software Testing & Quality Assurance Laboratory

CO No.	CO Statements (PC- PGCA1975 : Software Testing & Quality Assu	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Explain various approaches of software testing and quality assurance for software development.		3		3	3			3		3		3	3	3	3	3	Understand	Employability	Practical Assignmets				
	Create test strategies, design test cases, prioritize and execute them	3		3	3	3		3	3		3		3	3	3	3	3	Create	Entrepreneurship	Practical Assignmets				
CO3	Identify various risks involved with software projects and build risk management	3	3	3		3	3					3	3	3	3	3	3	Design	Entrepreneurship	Practical Assignmets				
CO4	Plan software management and configuration activities.	3		3	3	3		3	3		3	3	3	3	3	3	3	Design	Entrepreneurship	Practical Assignmets				
CO5	Discuss the risk management involved in software development.		2					3	3			3		2	2	2	2							

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1976 **Machine Learning and Data Analytics using Python**

CO No.	CO Statements (PC- PGCA1976 : Machine Learning and Data Anal	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Explain Machine Learning concepts	3						3				3	3	3				Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO2	Differenciate between supervised and unsupervised learning			3	3			3					3					Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO3	Discuss clustering and classification algorithms	3	3	3		3		3					3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO4	Analyse data using Python Numpy, Panda Libraries	3		3	3	3		3	3	3		3		3	3	3	3	Analyse	Employability	MSTs, ESE, Class/Quiz Tests				
CO5	Implement data visualization using matplotlib library of Python	3	3			3		3	3	3		3		3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA 1958 Advanced Web Technologies

CO No.	CO Statements (PC- PGCA 1958 : Advanced Web Technologies]	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understandanalyse/ daisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Explain client-side and server-side programming.	3					3	3					3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO2	Discuss web data and XML document handling.	3				3		3	3			3					3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO3	Describe the role of AJAX.			3	3	2		3				3		3	3	3		Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO4	Develop a dynamic webpage by the use of java PHP and MySQL.	3	3	3	3	3		3	3				3	3			3	Understand And Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests				
CO5	Apply basic CRUD database operations in a Dynamic Website.	3	3		2			3				3		3	3	3	3	Understand And Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests				
CO6	Discuss basic web services and their development.			3	3	3		3						3				Understand And Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1977 **Machine Learning and Data Analytics using Python Laboratory**

CO No.	CO Statements (PC: PGCA1977 : Machine Learning and Data Anal	PO-a (Computational Knowledge)	PO-b (Problem Analysis)	PO-c (Design /Development of Solutions)	PO-d (Conduct investigations of complex Computing problems)	PO-e (Modern Tool Usage)	PO-f (Professional Ethics)	PO-g (Life-long Learning)	PO-h (Project management and finance)	PO-i (Communication Efficacy)	PO-j (Societal and Environmental Concern)	PO-k (Individual and Team Work)	PO-l (Innovation and Entrepreneurship)	PSO-m (Understand and apply knowledge on analysis, design and development of applications in the computing discipline.)	PSO-n (Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.)	PSO-o (Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.)	PSO-p (Develop techniques to enhance ability for lifelong learning.)	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Develop knowledge of various learning models of data.		3	3	3			3	3			3		3	3	3		Design	Entrepreneurship	Practical Assignmets				
CO2	Implement a wide variety of learning algorithms				3	3		3					3	3	3	3	3	Create	Entrepreneurship	Practical Assignmets				
CO3	Evaluate models generated from data	3	3	3		3	3		3			3	3	3	3			Understand	Entrepreneurship	Practical Assignmets				
CO4	Apply the algorithms to a real-world problems	3			3		3		3							3	3	Understand	Entrepreneurship	Practical Assignmets				
CO5	Optimize the models learned and report on the expected accuracy that can be achieved by applying the models.	3	3			3		3				3		3	3	3	3	Design	Entrepreneurship	Practical Assignmets				

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Department Computer Science and Engineering
Program **Advanced Web Technologies Laboratory**

PGCA 1960 **Advanced Web Technologies Laboratory**

CO No.	CO Statements (PC- PGCA 1960) Advanced Web Technologies La	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Understand the advance concepts of website development						3	3	3				3	3	3	3	3	Understand	Entrepreneurship	Practical Assignmets				
CO2	Design dynamic web sites	3		3		3		3	3			3		3	3	3	3	Design	Entrepreneurship	Practical Assignmets				
CO3	Implement database programming for web applications		3	3	3	3		3				3	3	3	3	3	3	Design	Entrepreneurship	Practical Assignmets				
CO4	Implement jQuery methods, AJAX, Bootstrap and REACT	3		3	3	3		3	3			3		3	3	3	3	Understand And Design	Entrepreneurship	Practical Assignmets				
CO5	Perform basic CRUD operations	3	3			3		3					3	3	3	3	3	Understand And Design	Entrepreneurship	Practical Assignmets				
CO6	Develop market ready website, to be used by clients	3	3	3	3	3		3				3	3	3	3	3	3	Understand And Design	Entrepreneurship	Practical Assignmets				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1932 Information Security and Cyber Law

CO No.	CO Statements (PG- PGCA1932 : Information Security and Cyber Law)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Identify issues involved in the field of information security		3		3				3		3		3	3	3	3	3	Understan	Employab	MSTs, ESE, Class/Quiz Tests		
CO2	Explain the key security requirements of Confidentiality, Integrity & Availability	3	3	3							3	3		3	3	3	3	Understar	Employab	MSTs, ESE, Class/Quiz Tests		
CO3	Demonstrate the concept of Intrusion Detection & Intrusion Prevention	3	3	3	3	3		3	3		3		3	3	3	3	3	Understar	Employab	MSTs, ESE, Class/Quiz Tests		
CO4	Apply Symmetric Encryption techniques			3				3			3	3	3	3	3	3	3	Understar	Employability			
CO5	Describe the concept of Security policies and Cyber Laws			3	3	3		3	3		3			3	3	3	3	Understar	Employability			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1914 Web Technologies Laboratory

CO No.	CO Statements (PC- PGCA1914 : Web Technologies Laboratory)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Design pages with simple tags in HTML		3	3		3		3	3		3	3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Create web pages with Auido and Video content in it.		3	3	3	3	3	3	3			3	3	3	3	3	3	Design	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Illustrate the movement from one web page to another		3		3	3	3				3	3	3	3	3	3	3	Design	Entrepren	MSTs, ESE, Class/Quiz Tests	
CO4	Implement advanced web designing concepts using java script	3	3	3	3	3		3	3		3	3	3	3	3	3	3	Understan	Employability		
CO5	Execute a small web pased project for the benefit of scciety	3		3			3	3	3		2	3	3	3	3	3	3	Understan	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1922 Advanced Java Laboratory

CO No.	CO Statements (PC- PGCA1922 : Advanced Java Laboratory)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Implement servlets to handle HTTP requests			3	3		3	3				3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Demonstrate session and cookies management	3		3	3			3	3			3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Implement the concept of database management.	3	3	3				3						3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Outline the concept of SEO.	3			3		3	3	3			3	3	3	3	3	3	Understa	Employability		
CO5	Create applications using advanced concepts like JavaBean, Struts, Hibernate, etc.	3	2	3			3	3	3			3	3	3	3	3	3	n	t		
																		d	y		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1957 Linux System Administration Laboratory

CO No.	CO Statements (PC- PGCA1957 : Linux System Administration Laboratory)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Prepare the environment for installation and use of Linux operating system				3	3		3	3			3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Write Shell Scripts	3	3		3	3		3	3			3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	Implement C programs using gcc compiler	3	3	3	3		3	3	3			3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Impelment virtualization			3		3	3	3	3			3	3	3	3	3	3	Understa	Employability			
CO5	Execute commands related to grantinf and revoking user priviledges.	1				3						2	3	3								

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1925 **Advanced Computer Networking**

CO No.	CO Statements (PC- PGCA1925 : Advanced Computer Networking)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Define computer networks							3				3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Identify the role played by different layers of network model							3				3	3	3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	Outline the concept of Internet protocols and network security.	3	3	3	3			3						3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Highlight the benefits of Adhoc networks	3	3	3	3	3		3				3	3	3	3	3	3	Understar	Employability			
CO5	Explain the protocols used in wireless communication systems.	2		3				3				2	2	2	2	3						

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1926 **Artificial Intelligence & Soft Computing**

CO No.	CO Statements (PC- PGCA1926 : Artificial Intelligence & Soft Computing)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Highlight the significance of Artificial Intelligence in knowledge representation.	3			3	3	2	3	2			3		3	3	3		Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Examine the useful search techniques; learn their advantages, disadvantages and comparison.			3		3	3	2	3				3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	Explain neural network theory and fuzzy logic theory.			3	3	3		3				3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Apply artificial neural networks and fuzzy logic theory for various problems.	3	3	2	2	2	3		3		3				3		3	Understar	Employability			
CO5	Determine the use of Genetic algorithm to obtain optimized solutions to problems.				3	3		3	3	3		3	3	3	3	3	3	Understar	Employability			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1927 Theory of Computation

CO No.	CO Statements (PC- PGCA1927 : Theory of Computation)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus or	Assessment Tools to Measure Attainment of CO	
CO1	Define formal languages and automata.							3					3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Design Finite Automata's for different Regular Expressions and Languages	3		3	3			3					3	3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Prepare context free grammar for various languages	3	3	3	3		3	1	3					3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Illustrate how push down automata and Turing Machine can be used to solve computational problems.	3	3		2	3		3	3				3	3	3	3	3	Understar	Employability		
CO5	**Define complexity and computability concepts**	3	3	3			3	3	3				3	3	3	3	3	Understar	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1928 **Advanced Computer Networking Laboratory**

CO No.	CO Statements (PG- PGCA1928: Advanced Computer Networking Laboratory)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Demonstrate sharing of resources of network.							3				3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Prepate different types of network cables.							3	3	2	1	3	3	3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	Write programs for simulating routing algorithms	3	3	3	3			2	2	2		2	3	3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Implement the confuration of Adhoc networks	3	3	3	3	2	3	3	3	3	2	3	1	3	3	3	3	Understar	Employability			
CO5	Execute configuration of wireless access points	1	2	3				3				2	3	3	2	1	2	d	y			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1929 **Artificial Intelligence & Soft Computing Laboratory**

CO No.	CO Statements (PC- PGCA1929 : Artificial Intelligence & Soft Computing Laboratory)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Write programs for basic AI problems.			3		3		3	3			3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Apply artificial neural networks and fuzzy logic theory for various problems.		3	3	3			3	3		2	2	2	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	Prepare training data.	3	3		3	3	3	3		3	3	3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Design back propogation network	2		3					2			2										
CO5	Implement different operations on fuzzy sets	3	3	3									3									

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1930 **Software Project Management**

CO No.	CO Statements (PC- PGCA1930 : Software Project Management)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Define the principal tasks of software project management		3	3		3		3	3	3		3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Outline the basic concepts of Software projects.		2	3		3	3			3		3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Explain the fimdamentals of Process Planning, effort estimation and quality planning	3	3		3	2	3	3	3	2			2	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Comment upon risk and quality management.	3		3	3	3			3	3		3	3	3	3	3	3	Understa	Employability		
CO5	Apply management and development practices to develop software.						3	3	3	3	2	2	1	3	2	1	3	Understa	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1971 **Optimization Techniques**

CO No.	CO Statements (PC- PGCA1971: Optimization Techniques)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ deisgn etc)	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Define the scope of operation research			3	3	3		3	3			3		3	3	3	2	Understand	Employabi	MSTs, ESE, Class/Quiz Tests		
CO2	Solve linear programming problems		3	3		3		3				3	3	2	3	3	3	Understand	Employabi	MSTs, ESE, Class/Quiz Tests		
CO3	Prepare feasible solutions for transportation and assignment problems	3		3	3	3		3					3	3	3	2	3	Understand	Employabi	MSTs, ESE, Class/Quiz Tests		
CO4	Outline the Project Management problems using CPM	2	3	3		3		3	3			3	3	3	3	3	3	Understand	Employability			
CO5	Find solution to various optimization problems	1	2	3	1	1						3	3	2	2	3	2	Understand	Employability			

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Department Computer Science and Engineering
PGCA1972 Master of Computer Applications (MCA)
PGCA1972 **Data Mining and Business Intelligence**

CO No.	CO Statements (PC- PGCA1972: Data Mining and Business Intelli	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO				
CO1	Highlight the need of Data Warehousing & Mining	3			3			3	3					3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests				
CO2	Differentiate between the Transactional and Analytical data models.		3	3				3	3			3	3	3	3	3	3	Understand And Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests				
CO3	Identify the real life applications where data mining can be applied.	3	3		3			3					3	3	3	3	3	Analyse	Entrepreneurship	MSTs, ESE, Class/Quiz Tests				
CO4	Apply different data mining algorithms on wide range of data sets.			3				3	3			3		3	3	3	3	Understand And Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests				
CO5	Comment on latest tools for data mining and big data analysis			3	2			2										Understand and Design	Entrepreneurship					

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1973 **Enterprise Resource Planning**

CO No.	CO Statements (PC- PGCA1973 : Enterprise Resource Planning)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO	
CO1	Define ERP & Related Technologies							3	3					3	3	3	2	Understand and Analyse	Employability	MSTs, ESE, Class/Quiz Tests	
CO2	Compare different types of ERP functional modules.			3	3									3	3		2	Understand	Employability	MSTs, ESE, Class/Quiz Tests	
CO3	Explain Implementation Strategies of ERP	3						3				3				3		Design	Employability	MSTs, ESE, Class/Quiz Tests	
CO4	Discuss the latest trends and domains of ERP.			3				3	3				3	3	3	3		Understand	Employability	MSTs, ESE, Class/Quiz Tests	
CO5	Analyze various case studies related to ERP implementation	2	2	2	3	1							3	3	2	2	2	understand	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1955 **Advanced Database Management System Laboratory**

CO No.	CO Statements (PC- PGCA1955 : Advanced Database Management System Laboratory)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-l	PSO-m	PSO-n	PSO-o	PSO-p	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Implement query a database using SQL DML/DDL commands.	3	3	3	3	3		3	3		3		3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Analyze integrity constraints on a database	3		3			3	3	3		3		3	3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	Develop PL/SQL programs including stored procedures, stored functions, cursors		3	3	3	3	3	3	3		3		3	3	3	3	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Design new database and modify existing ones for new applications and reason about the efficiency of the result	3		3		3	3	3	3		3		3	3	3	3	3	Design	Employability			
CO5	Execute the role of DBA	1		3	3	3	3		3	3	3		3	3	3	3	3	Understar	Employability			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1908 Technical Communication Laboratory

CO No.	CO Statements (PC- PGCA1908 : Technical Communication Laboratory)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Demonstrate the benefits of effective communication		2	2	2		3	3		3	3			2		3	2	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Execute proficiency in reading & listening, comprehension, writing and speaking skills.		3		2		3	3		3	3			2		3	2	Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	Apply spoken and written English language in their chosen technical field.	2	2	2			3	3	3	3	3	3			2	3		Understar	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Illustrate fluency in coversation.	2	3				3	3		3	2	3	3	3	2	3	3	Understar	Employability			
CO5	Write their own clear and coherent texts.		2				3	3	3	3	3	3	3	3	2		3	Understar	Employability			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1909 Web Technologies

CO No.	CO Statements (PC- PGCA1909 : Web Technologies)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus or	Assessment Tools to Measure Attainment of CO	
CO1	Create pages with simple tags in HTML		3	3		3		3	3		3	3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Design webpages with multiple sections or frames		3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Explain how to link webpages through hypertext or images a links		3	2	3		2	3				3	2	3	3	3	3	Design	Entrepren	MSTs, ESE, Class/Quiz Tests	
CO4	Outline the key web designing concepts using java script	3		3	2	3		2		3	3	2	3	3	3	3	3	Design	Entrepreneurship		
CO5	Design forms with special controls using HTML	3	3	3	3	3	3	3			3	3	3	3	3	3	3	Design	Entrepreneurship		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1920 **Design & Analysis of Algorithms**

CO No.	CO Statements (PC- PGCA1920 : Design & Analysis of Algorithms)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Define alforithm and its complexity							3						3	3	2	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Categorize problems based on their characteristics and practical importance	3	3	3	3			3				3	3	3	3	3	3	Design	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Develop Algorithms using iterative/recursive approach	3	3	3	3			3	3			3	3	2	3	3	3	Design	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Design algorithm using an appropriate design paradigm for solving a given				3			3	3			3	3	3	3	3	2	Understar	Employability		
CO5	Categorize problems as P, NP or NP Complete	3						2						3		2	3				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1918 Advanced Java

CO No.	CO Statements (PC- PGCA1918 : Advanced Java)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Explain the role of servlets		3	3	3	3		3	3			3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Select the right technology/ tool for problem based solutions	3	3	3	3			3	3			2	3	3	3	2	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Implement web concepts using java server pages	3	3	3	3	3		3	3	3	3	3	3	3	3	3	3	Design	Entrepren	MSTs, ESE, Class/Quiz Tests	
CO4	Implement database connectivity	3				3			2	1				1		3		Understa e			
CO5	Illustrate invocation of remote methods		2			3		3					3	3	2	2	1	Understand			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1956 Linux Administration

CO No.	CO Statements (PC- PGCA1956 : Linux Administration)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Discuss the evolution of Open Source operating systems.					3		3	3			3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Prepare environment for working on open source operating system like	3	3	2	3	3		3	3			3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Perform resource management in Linux	3	3	3		2	3	3	3			3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Write scripts in Linux.			3		3	3	3	3			3	3	3	3	3	3	Understa	Employability		
CO5	Execute user level priviledges				2	2							3	3	2	2	1	Understa	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1937 Cloud Computing

CO No.	CO Statements (PC- PGCA1937 : Cloud Computing)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design/Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques for enhance ability for lifelong learning.	Learning Level(understand/analyze/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Discuss the basic concept and importance of cloud computing.	3					3	3	3				3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Explain the process of migrating to a cloud solution for different applications.	3		3				3	3			3	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Compare and evaluate the virtualization technologies	3	3	3	3								3	3			3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Monitor and manage the cloud resources, applications and data while addressing the security concerns.				3		3		3				3	3	3			Understand And Design	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Use cloud solutions offered by industry leaders for various applications.	3	3	2	3		3	3					3	3	3	3		Understand And Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA-B2 **Computer Science Essentials**

CO No.	CO Statements (PC- PGCA-B2 : Computer Science Essentials)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Profesional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO
CO1	Identify various components of computer system including input and output devices.	3	2	2				3				2	2	1		2	2	Understan	Employat	MSTs, ESE, Class/Quiz Tests
CO2	Prepare documents using word processing, Spreadsheet and Presentation tools.	3	2	2	2	2		3			2		2	2	2	2	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests
CO3	Outline the key components of Database Management system	3		3	2			3	3					2	2	2	3	Understar	Employat	MSTs, ESE, Class/Quiz Tests
CO4	Explain the role of operating system.	2		3	2			3	2					2	2	3	3	Understar	Employability	
CO5	Define various components, modes and topologies of computer networks.	2	3	3	3	1	2	3	2				3	2	2	3	3	d	y	

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1917 **Discrete Structures &Optimization**

CO No.	CO Statements (PC- PGCA1917 : Discrete Structures &Optimization	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Explain the use of Venn diagrams to solve applied problems.	3	3	3	2			3				2	3			3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Apply rules of inference.	2	2	3	3			3				2	3		3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Write proofs using symbolic logic and Boolean Algebra	3	3	3	2			3			3	3	3	3		3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Applying elementary counting techniques using the product and sum rules, permutations, combinations, the pigeon-hole principle.	3	3	3	3			3				3	3	3	3	3	3	Analyse	Employability		
CO5	Identify the type of graphs.	3	3	3		1		3				1	1	3	3	3	3	Design	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1951 Programming in Python

CO No.	CO Statements (PC- PGCA1951: Programming in Python)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Explain environment, data types, operators used in Python.	3	3	3	3			3	1			2	3	3	2	3	3	Inderstan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Compare Python with other programming languages.	3	2	3	3			2	2				3	3	3	2	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Outline the use of control structures and numerous native data types with	2	3	3	3			2	2				3	3	3	2	3			MSTs, ESE, Class/Quiz Tests	
CO4	Design user defined functions, modules, files, and packages and exception	3	2	3	3			2	2			2	3	3	3	2	3				
CO5	Write solutions for Object Oriented Programming Concepts.	3	3	3	3			2	2				3	3	3	2	3				

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1952 Advanced Data Structures

CO No.	CO Statements (PC- PGCA1952 : Advanced Data Structures)	Computational Knowledge PO-a	Problem Analysis PO-b	Design /Development of Solutions PO-c	Conduct investigations of complex Computing problems PO-d	Modern Tool Usage PO-e	Professional Ethics PO-f	Life-long Learning PO-g	Project management and finance PO-h	Communication Efficacy PO-i	Societal and Environmental Concern PO-j	Individual and Team Work PO-k	Innovation and Entrepreneurship PO-l	Understand and apply knowledge on analysis, design and development of applications in the computing discipline. PSO-m	Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values. PSO-n	Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions. PSO-o	Develop techniques to enhance ability for lifelong learning. PSO-p	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Choose appropriate data structures and algorithms and use it to design	3	3	3	3	2	2	3	2			3	3	3	3	3	3	Analyse	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Execute the operations of hashing to retrieve data from data structure	3	2	3	2	3	2	3	3			3	3	3	3	3	3	Analyse	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Design and analyze programming problem statements	3	3	3	3	3	3	3	3			3	2	3	3	3	3	Design	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Define proofs of correctness	3	2	3				2	3			3	3	3	3	3	3	Understar	Employability		
CO5	Select algorithm design approaches in a problem specific manner	3	3	3	3			3	3	3				3	3	3	3	Understar	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA 1953 Advanced Database Management System

CO No.	CO Statements (PC- PGCA 1953 : Advanced Database Management System)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO		
CO1	Express the basic concepts of DBMS and RDBMS.		3			3	3	3	3			3	3	3	3	3	3	Understan	Employat	MSTs, ESE, Class/Quiz Tests		
CO2	Apply normalization theory to the normalization of a database	3		3	3	3	3	3	3			3	3	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests		
CO3	ExplainTransaction Management & Recovery techniques in RDBMS.	3	3		3		1	3	3		3		2	3	3	3	3	Understa	Employat	MSTs, ESE, Class/Quiz Tests		
CO4	Outline characteristics of advanced databases prevailing in market.		3		2	3	3	3				3	3	3	3	3	3	Understa	Employability			
CO5	Demonstrate No SQL databases (Open Source)			3	3	3	3	2	3			3	3	3	3	3	3	Understa	Employability			

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1905 Technical Communication

CO No.	CO Statements (PC- PGCA1905 : Technical Communication)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Profesional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning	Focus on	Assessment Tools to Measure Attainment of CO	
CO1	Outline the benefits of effective communication	1					3	3	2	3	3	2		2	1	3	2	Understan	Employat	MSTs, ESE, Class/Quiz Tests	
CO2	Execute proficiency in reading & listening, comprehension, writing and speaking skills		3				3	3	2	3	3	2		2	1	3	2	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO3	Apply spoken and written English language in their chosen technical field.	1					3	3	3	3	3	3			2	3	2	Understa	Employat	MSTs, ESE, Class/Quiz Tests	
CO4	Illustrate flueny in coversation.		3				3	3	3	3	3	3	3	3	2	3	3	Understa	Employability		
CO5	Write their own clear and coherent texts.						3	3	3	3	3	3	3	3	2	2	3	Understa	Employability		

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Department Computer Science and Engineering
Program Master of Computer Applications (MCA)
PGCA1954 Data Structures using Python Laboratory

CO No.	CO Statements (PC- PGCA1954 : Data Structures using Python Laboratory)	PO-a Computational Knowledge	PO-b Problem Analysis	PO-c Design /Development of Solutions	PO-d Conduct investigations of complex Computing problems	PO-e Modern Tool Usage	PO-f Professional Ethics	PO-g Life-long Learning	PO-h Project management and finance	PO-i Communication Efficacy	PO-j Societal and Environmental Concern	PO-k Individual and Team Work	PO-l Innovation and Entrepreneurship	PSO-m Understand and apply knowledge on analysis, design and development of applications in the computing discipline.	PSO-n Use of recent technology, skill and knowledge for computing practice with commitment on societal, moral values.	PSO-o Inculcate employability and entrepreneur skills among students who can develop customized enterprise level solutions.	PSO-p Develop techniques to enhance ability for lifelong learning.	Learning L	Focus on E	Assessment Tools to Measure Attainment of CO		
CO1	Analyze various algorithms based on their time and space complexity.	3	3	3	3			3					3	3		3	3	Understand	Employabil	MSTs, ESE, Class/Quiz Tests		
CO2	Create different data structures in C/ C++		3	3	3			3				3	3	3		3	3	Understand	Employabil	MSTs, ESE, Class/Quiz Tests		
CO3	Implement various operations of all data structures	3	3	3	3	3	2	3	3			3	3	3	3	3	3	Analyse	Employabil	MSTs, ESE, Class/Quiz Tests		
CO4	Illustrate the outcome of various operations with the help of examples.	2	3	1		1		3							2	3	3	e	y			
CO5	Write programs to implement various types of searching and sorting algorithms	3	3	1		1	2	3				2	3	3	3	3	1	d	y			

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1947 : (Digital Marketing)

CO No.	CO Statements (UC-UGCA1947 : Digital Marketing)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainabili	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Highlight the key elements of a digital marketing strategy.	3	2						2	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Choose the right platform for digital marketing.	3	3	2					2	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Identify the major digital marketing channels.	3	3	2					2		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Design content for digital marketing.	3	3	3	2				3		3	2	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Develop digital marketing strategy and plan.	3	3	3	2				3		3	2	2	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1948 : (Information Security)

CO No.	CO Statements (UC-UGCA1948: Information Security)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Identify issues involved in the field of information security.	3	3						2	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Categorize various types of viruses.	3	2						2	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Outline the information security risks across de Internet and WWW.	3	3			2	2	2	3	2	3	3	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Explain different encryption techniques	3	3	3					3		3	2	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Define crytography	3	2	2					3		3	2	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests

Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1949 : (Cyber Laws & IPR)

CO No.	CO Statements (UG-UGCA1949: Cyber Laws & IPR)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Identify tatutory, regulatory, constitutional, and organizational laws that affect the information technology professional.	3	3	2					2		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Categorize case law and common law to current legal dilemmas in the technology field.	3	2	2					2		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Outline the primary forms of intellectual property rights.	3	3	2		2	2	2	3	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Compare the different forms of intellectual property protection in terms of their key differences and similarities.	3	3	3				2	3	2	3	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Analyze the effects of intellectual property rights on society as a whole.	3	2	2		2		2	3	2	3	2	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1950 : (Machine Learning)

CO No.	CO Statements (UG-UGCA1950 : Machine Learning)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Define the concept of machine learning	3	2						2	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Outline the key characteristics of machine learning algorithms	3	2						3	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Compare the performace of different machine learning algorithms	3	3	3	2				3		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Design solution for basic problems using machine learning algorithms	3	3	3					2		3	2	2	2	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Explain the concept of reinforcement learning	3	3	3					2		3	2	2	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests

Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainabili	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1951 : (Artificial Intelligence Laboratory)

CO No.	CO Statements (UC- UGCA1951: Artificial Intelligence Laborat	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainabilit	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Identify right tool for different AI based problems.	3	2	2	2				2	2	3	3			Understand	Employability	Practical Assignments
CO2	Develop basic applications using AI tools.	3	2	3	2				2		3	3	2	3	Design	Employability	Practical Assignments
CO3	Represent various real life problem domains using logic based techniques	3	3	3	2	2	2	2	3	2	3	3	3	3	Design	Employability	Practical Assignments
CO4	Outline the use of Bayesian approach to solve uncertain problems.	3	3	3	3				3		3	3	2	3	Design	Employability	Practical Assignments
CO5	Implement basic Natural Language processing programs.	3	3	3	3				3		3	3	3	3	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1952 : (R Programming Laboratory)

CO No.	CO Statements (UC-UGCA1952: R Programming Laboratory)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Write programs for arrays and matrices.	3	2	2	2				2		3	3	2		Design	Employability	Practical Assignments
CO2	Execute data frames and lists.	3	2	3	2				2		3	3			Design	Employability	Practical Assignments
CO3	Differentiate between arrays from vectors.	3	3	3	2				3		3	3			Design	Employability	Practical Assignments
CO4	Implement factors in R	3	3	3	3				3		3	3	2	2	Design	Employability	Practical Assignments
CO5	Execute minor projects using R.	3	3	3	3				3		3	3	2	2	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1953 : (Digital Marketing Laboratory)

CO No.	CO Statements (UC-UGCA1953: Digital Marketing Laboratory)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Highlight the key elements of a digital marketing strategy.	3	2						2		3	3			Understand	Employability	Practical Assignments
CO2	Implement common digital marketing exercisesuing SEO, Social media and Blogs.	3	2	3					2	2	3	3			Design	Employability	Practical Assignments
CO3	Identify the major digital marketing channels.	3	3	3					3	2	3	3	2	2	Design	Employability	Practical Assignments
CO4	Design content for digital marketing.	3	3	3	2				3	2	3	3	2	2	Design	Employability	Practical Assignments
CO5	Develop digital marketing strategy and plan.	3	3	3	2				3	2	3	3	2	2	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1954 : (Information Security Laboratory)

		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainabili	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO No.	**CO Statements (UC-UGCA1954: Information Security Laborato**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PSO-k**	**PSO-l**	**PSO-m**	**Learning Level(understand/analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	Outline various types of attacks.	3	2						2	2	3	3			Understand	Employability	Practical Assignments
CO2	Categorize various types of viruses.	3	2	2					2		3	3			Understand	Employability	Practical Assignments
CO3	Prepare solutions to various threats	3	3	3					3		3	2	2		Understand	Employability	Practical Assignments
CO4	Review security policy	3	3	3		2	2	2	3	2	3	2	2	2	Design	Employability	Practical Assignments
CO5	Implement Encyption Techniques	3	3	3	3				3		3	2	2	2	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1955 : (Cyber Laws & IPR Laboratory)

		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO No.	**CO Statements (UC-UGCA1955: Cyber Laws & IPR Laboratory**	**PO-a**	**PO-b**	**PO-c**	**PO-d**	**PO-e**	**PO-f**	**PO-g**	**PO-h**	**PO-i**	**PO-j**	**PSO-k**	**PSO-l**	**PSO-m**	**Learning Level(understand/analyse/ deisgn etc)**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1	Identify tatutory, regulatory, constitutional, and organizational laws that affect the information technology professional.	3	3	2					2		3	3			Understand	Employability	Practical Assignments
CO2	Categorize case law and common law to current legal dilemmas in the technology field.	3	2	2					2		3	3			Understand	Employability	Practical Assignments
CO3	Outline the primary forms of intellectual property rights.	3	3	2		2	2	2	3	2	3	3			Understand	Employability	Practical Assignments
CO4	Compare the different forms of intellectual property protection in terms of their key differences and similarities.	3	3	3				2	3	2	3	2			Understand	Employability	Practical Assignments
CO5	Analyze the effects of intellectual property rights on society as a whole.	3	2	2		2		2	3	2	3	2	2	2	Understand	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1956 : (Machine Learning Laboratory)

CO No.	CO Statements (UC-UGCA1956: Machine Learning Laboratory)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Differentinte between various data types.	3	2	2					2	2	3	3			Understand	Employability	Practical Assignments
CO2	Implement programs for various Learning algorithms.	3	2	2	2				3	2	3	3	2		Design	Employability	Practical Assignments
CO3	Compare different machine learning algorithms.	3	3	3	2				3	2	3	3	2		Understand	Employability	Practical Assignments
CO4	Choose the right algorithm for different problems.	3	3	2					2		3	2	2	2	Design	Employability	Practical Assignments
CO5	Apply Machine Learning algorithms to solve real world problems.	3	3	3	2	2	2	1	2		3	2	2	3	Design	Employability	Practical Assignments

Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1957 : (Software Project Management)

CO No.	CO Statements (UC-UGCA1957: Software Project Management)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainabili	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Define the principal tasks of software project managers. and basic concepts in software projects.	3	2						2		3	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Outline the basic concepts of Software projects.	3	2						3		3	3			Underatand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Explain the fundamentals of Process Planning, effort estimation and quality planning.	3	3						3		3	3	2		Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Comment upon risk and quality management.	3	3						2		3	2		2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Apply management and development practices to develop software.	3	3	3	2				2		3	2	2	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1901 : Mathematics

CO No.	CO Statements (UC-UGCA1901: Mathematics)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Define various mathematical notions.	3	2	1					2		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Explain different terms used in basic mathematics.	3	3	3					3		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Illustrate various operations and formulas used to solve mathematical problems.	3	3	3		2			3		3	3			Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Organize data in various models.	3	2	1					2				2		Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Prepare solutions for various real life problems.	3	3	3		3			3		2	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1939 : (Internet of Things Laboratory)

CO No.	CO Statements (UC-UGCA1939: Internet of Things Laboratory	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Identify different types of IOT devices and sensors.	3	3						2	2	3	3	2	2	Understand	Entrepreneurship	Practical Assignments
CO2	Analyze sensor generated data	3	3	3	3				2		3	3	2	2	Analyse	Entrepreneurship	Practical Assignments
CO3	Outline the use of bluetooth for connectivity of mobile application with IOT device	3	3	3	3				3	2	3	3	3	3	Design	Entrepreneurship	Practical Assignments
CO4	Designing small IoT applications	3	3	3	3				3	2	3	3	3	2	Design	Entrepreneurship	Practical Assignments
CO5	Bulding interface of application with various devices	3	3	3	3				3	2	3	3	3	3	Design	Entrepreneurship	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1940 : (Computer Graphics Laboratory)

CO No.	CO Statements (UC-UGCA1940: Computer Graphics Laboratory)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainabili	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Implement algorithms for drawing basic shapes like circle, line and point	3	3	2	2				2	2	3	3	2	2	Understand	Entrepreneurship	Practical Assignments
CO2	Write programs to implement 2-D and 3-D corrdibate transformations.	3	3	3	2				2		3	3	2	2	Design	Entrepreneurship	Practical Assignments
CO3	Design basic shapes for logo's	3	3	3	2				3	2	3	3	3	3	Design	Entrepreneurship	Practical Assignments
CO4	Develop programs for basic animations using C or C++	3	3	3	3				3	2	3	3	3	2	Design	Entrepreneurship	Practical Assignments
CO5	Design a small gaming project.	3	3	3	3				3	2	3	3	3	3	Design	Entrepreneurship	Practical Assignments

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Department: Computer Science and Engineering
Program: Bachelor of Computer Applications (BCA)
UGCA1941 : (Linux Operating System Laboratory)

CO No.	CO Statements (UC-UGCA1941: Linux Operating System Labo	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainable	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Prepare the environment for installation and use of Linux operating system	3	3	2					2		3	3			Understand	Entrepreneurship	Practical Assignments
CO2	Write Shell Scripts	3	3	3	2				2		3	3			Design	Entrepreneurship	Practical Assignments
CO3	Implement C programs using gcc compiler.	3	3	3	2				2		3	3	3	2	Design	Entrepreneurship	Practical Assignments
CO4	Impelment virtualization	3	3	3	2				2		3	3	3	2	Design	Entrepreneurship	Practical Assignments
CO5	Execute commands related to grantinf and revoking user priviledges.	3	3	3	3				2		3	3	3	2	Design	Entrepreneurship	Practical Assignments

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Department: Computer Science and Engineering
Program: Bachelor of Computer Applications (BCA)
UGCA1942 : (Cloud Computing Laboratory)

CO No.	CO Statements (UC-UGCA1942: Cloud Computing Laboratory	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ delsgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Identify major commercial projects in the field of cloud computing	3	2						2	2	3	3			Understand	Employability	Practical Assignments
CO2	Design basic cloud applications	3	2	3	2				2		3	3			Design	Employability	Practical Assignments
CO3	Execute basic functionalities of open source tools like Open Stack.	3	3	3	2				2		3	3	2	2	Design	Employability	Practical Assignments
CO4	Implement virtualization	3	3	3	2				2		3	3	2	2	Design	Employability	Practical Assignments
CO5	Define major services provided by cloud service provider.	3	2			2	2	2	2	2	3	3			Understand	Employability	Practical Assignments

Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.

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Department: Computer Science and Engineering
Program: Bachelor of Computer Applications (BCA)
UGCA1943 : (Android Programming)

CO No.	CO Statements (UC-UGCA1943: Android Programming)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Prepare environment for working on Android OS	3	2	2	2				2		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Highlight various security issues in Android platform.	3	3			2	2	2	2	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Design innovative User Interface and develop activity for android app.	3	3	3	2				2		3	3	2	2	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Outline the steps for creating database applications.	3	3	3	2				3	2	3	3	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Write programs for basic Android based applications.	3	3	3	2				3	2	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1944 : (Android Programming Laboratory)

CO No.	CO Statements (UC-UGCA1944: Android Programming Laboratory)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Prepare environment for working on Android OS.	3	2	2	2				2	2	3	3			Understand	Employability	Practical Assignments
CO2	Program basic Android based applications.	3	2	3	2				2		3	3	2	3	Design	Employability	Practical Assignments
CO3	Highlight various security issues in Android platform.	3	3	3	2	2	2	2	3		3	3	3	3	Design	Employability	Practical Assignments
CO4	Implement database applications.	3	3	3	3				3	2	3	3	2	3	Design	Employability	Practical Assignments
CO5	Design innovative User Interface and develop activity for android app.	3	2	3	3				3	2	3	3	3	3	Design	Employability	Practical Assignments

Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1945 : (Artificial Intelligence)

CO No.	CO Statements (UC-UGCA1945: Artificial Intelligence)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Higlight the significance and domains of Artificial Intelligence and knowledge representation.	3	3						2	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Outline the advtantages and disadvantages of various search techniques.	3	3	2					3	2	3	3	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Identify various Expert Systems and AI applications.	3	3	2					3		3	3	2	2	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Define the role of AI in different areas like NLP, Pattern Recognition etc.	3	3	3					3	2	3	3	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Select the righ AI tool for different AI based applications.	3	3	3	3				3	2	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1946 : (R Programming)

CO No.	CO Statements (UC-UGCA1946 : R Programming)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ delegn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Identifiy the key components of R programming Language.	3	2						2		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Define the concept of data Science.	3	3						2		3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Differentiate between vectors and arrays.	3	3	2					2	2	3	3	2		Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Outline the usage of data frames, lists, factors, tables and R structures.	3	3	3					3	2	3	3	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Explain the need and utilization of vacrious visualization tools.	3	3	3	3				3	2	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1924 : (Software Engineering Laboratory)

CO No.	CO Statements (UC-UGCA1924: Software Engineering Laboratory)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Identify the scope and objective of different domains that have impact on society	2	3			3	3	2	2	1	3	2			Understand	Employability	Practical Assignments
CO2	Create data flow diagrams	3	3	3	3				2	2	3	2		2	Design	Employability	Practical Assignments
CO3	Compute software complexity using latest tools	3	3	3	3				2	3	3	3	2	3	Design	Employability	Practical Assignments
CO4	Design a software engineering process life cycle.	3	3	3	3				2	2	3	3	2	2	Design	Employability	Practical Assignments
CO5	Implement specification, design, implementation, and testing process using latest tools	3	3	3	3	2	2	1	3	2	3	3	2	2	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1925 : (Database Management Systems Laboratory)

CO No.	CO Statements (UC-UGCA1925: Database Management Systems Laboratory)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainabil	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Differentiate between DDL, DML and DCL commands	3	3	3	3				2		3	2			Analyse	Employability	Practical Assignments
CO2	Implement DDL, DML and DCL commands	3	3	3	3				2		3	2		2	Design	Employability	Practical Assignments
CO3	Write integrity constraints on a database	3	3	3	3				2		3	3	2	3	Design	Employability	Practical Assignments
CO4	Design Databases and Tables in relational model for some project related to society welfare	3	3	3	3	3	3	2	3	3	3	3	2	2	Design	Employability	Practical Assignments
CO5	Implement PL/SQL.	3	3	3	3				3		3	3	2	2	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1926 : (Operating Systems Laboratory)

CO No.	CO Statements (UC-UGCA1926: Operating Systems Laboratory	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	2 Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Implement the installation and configuration of different operating systems.	3	3	3	3				3	2	3	1	3	3	Design	Employability	Practical Assignments
CO2	Write programs for different scheduling algorithms.	3	3	3	3				3		3	1	3	3	Design	Employability	Practical Assignments
CO3	Execute various commands in Vi editor	3	3	3	3				3		3	1	2	3	Design	Employability	Practical Assignments
CO4	Implement the dual boot installation	3	3	3	3				3	3	3	2	3	3	Design	Employability	Practical Assignments
CO5	Execute commands in shell programming	3	3	3	3				3		3	2	3	2	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1927 : (Web Designing)

CO No.	CO Statements (UC-UGCA1927 : Web Designing)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainable	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Create pages with simple tags in HTML	3	3	3	3				3	2	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Design webpages with multiple sections or frames	3	3	3	3				3	2	3	3			Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Explain how to link webpages through hypertext or images a links	3	3	3	3				3	2	3	3	3	2	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Outline the key web designing concepts using javn script	3	3	3	3				3	2	3	3	3	2	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Design forms with special controls using HTML	3	3	3	3				3	3	3	3	3	2	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1928 : (Web Designing Laboratory)

CO No.	CO Statements (UC-UGCA1928: Web Designing Laboratory)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Design pages with simple tags in HTML.	3	3	3	2				2	2	3	3	3		Design	Entrepreneurship	Practical Assignments
CO2	Create web pages with Audio and Video content in it.	3	3	3	3				2	3	3	3	3		Design	Entrepreneurship	Practical Assignments
CO3	Illustrate the movement from one web page to another	3	3	3	2				3	3	3	3	3	3	Design	Entrepreneurship	Practical Assignments
CO4	Implement advanced web designing concepts using java script	3	3	3	3				3	2	3	3	3	2	Design	Entrepreneurship	Practical Assignments
CO5	Execute a small web based project for the benefit of society	3	3	3	3	2	2	2	3	2	3	3	3	3	Design	Entrepreneurship	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1930 : (Programming in PHP Laboratory)

CO No.	CO Statements (UC-UGCA1930: Programming in PHP Laboratory)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of C
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainabili	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Write scripts for basic web page designs	3	3	3	2				2	2	3	3	3		Design	Entrepreneurship	Practical Assignments
CO2	Design the work flow of web page with the help of various control statements	3	3	3	2				2	3	3	3	3		Design	Entrepreneurship	Practical Assignments
CO3	Differentiate between client side and server side scripting	3	3	3	3				3	3	3	3	3	3	Design	Entrepreneurship	Practical Assignments
CO4	Illustrate the concept of static and dynamic websites	3	3	3	3				3	2	3	3	3	2	Design	Entrepreneurship	Practical Assignments
CO5	Implement the database concepts in PHP	3	3	3	3				3	2	3	3	3	3	Design	Entrepreneurship	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1931 : (Data Warehouse and Mining)

CO No.	CO Statements (UC-UGCA1931: Data Warehouse and Mining)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainabili	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Highlight the need of Data Warehousing & Mining	3	3						2		3	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Differentiate between the Transactional and Analytical data models.	3	3	2					2		3	2			Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Identify the real life applications where data mining can be applied.	3	3	2		2	2	2	3	2	3	3	2	2	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Apply different data mining algorithms on wide range of data sets.	3	3	3	3				2	2	3	3	2	3	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Explain the role of visualization in data representation and analysis.	3	3	2	3				2	2	3	3	3	3	Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1902 : (Fundamentals of Computer and IT)

CO No.	CO Statements (UG-UGCA1902: Fundamentals of Computer and	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Identify of input and output devices of Computers	3	3	3	3				1		3	3	1	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Uitline the functiuoning of various components of computer system	3	3	3	3				2	2	3	3	2	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Define the role of Operating system	3	3	2	2	2				2	3	3	1	1	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Prepare documents using word processing, Spreadsheet and Presentation Graphics Softwares.	3	2	3	3	2			3		3	3	1		Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Highlight the Internet safety, legally, and and other issues.	3	3	2	2	3	2	3	1		3	3	2	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1903 : (Problem Solving using C)

CO No.	CO Statements (UC- UGCA1903: Problem Solving using C)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Express the logical flow used in Programming.	3	2	2					2		3	1			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Design algorithms for solving various real life problems.	3	2	3					3		3	2	3	2	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Implement programs using C .	3		3	3				3		3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Choose the right data type and statements for programs.	3		2	2						3	2	2		Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Explain various concepts of C programming language.	3	2	2		1					3	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1904 : (Workshop on Desktop Publishing)

CO No.	CO Statements (UC-UGCA1904: Workshop on Desktop Publishing)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainabilit	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Outline the characteristcs of desktop publishing tools.	3									3				Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Identify the right componets for designing documents.	3	1	2							3	2		2	Understand & Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO3	Apply knowledge in designing various documents.	3		3	2		1		2		3	2	2	3	Understand & Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO4	Prepare different types of granhic related documents.	3		3	2		2		3		3	2	2	3	Understand & Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests
CO5	Express the messages through graphical content	3		3	2		2		2	2	3	2	2	3	Understand & Design	Entrepreneurship	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1905 : (Problem Solving using C Laboratory)

CO No.	CO Statements (UC-UGCA1905: Problem Solving using C Laboratory)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Select the right statement for the program.	2		1											Understand	Employability	Practical Assignments
CO2	Experiment with different input values.	3	3	3	2				3		3	3	3		Understand And Design	Employability	Practical Assignments
CO3	Test the output with boundary conditions.	3	2	3	3				3		3	3	3		Design	Employability	Practical Assignments
CO4	Distinguish between various control statements and data types.	3	2	3	3				3		3	3	3	2	Design	Employability	Practical Assignments
CO5	Implement programs for various problems.	3	2	3	3	2	2		3	2	3	3	3	3	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1906 : (Fundamentals of Computer and IT Laboratory)

CO No.	CO Statements (UC-UGCA1906: Fundamentals of Computer and IT Laboratory)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainabil	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Highlight the features of word processing, spreadsheet and presentation tools	3	3	1								2	1	2	Understand	Employability	Practical Assignments
CO2	Identify the right componets for its documents on editor, spread sheet and presentation software	3	3	3	3				3		3	3	3		Understand And Design	Employability	Practical Assignments
CO3	Prepare documents and apply formatting	3	2	3	3				3		3	3	3		Design	Employability	Practical Assignments
CO4	select the right tool for different requirements	3	2	3	3				3		3	3	3	2	Design	Employability	Practical Assignments
CO5	Apply various operations	3	2	3	3	2	2		3	2	3	3	3	3	Design	Employability	Practical Assignments

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1907 : (Fundamentals of Statistics)

CO No.	CO Statements (UC-UGCA1907: Fundamentals of Statistics)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Highlight the need of studying & analyzing numbers.	3	3					2	2	2	3				Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Identify visualization tools for representing data.	3	3	3	3				2	2	3	2		3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Describe various statistical formulas.	3	3	3	2				2		3	2	3	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Compute various statistical measures.	3	3	3	2				2		3	2	3	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Compare result of different statistical measures.	3	3	3		2	2		2	2	3	2	2		Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1908 : (Computer System Architecture)

CO No.	CO Statements (UC-UGCA1908: Computer System Architecture)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Identify the various internal and peripheral components of computer system	3	3	2	2				2	3	3	3			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Categorize different number system.	3	3	2					2	2	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Outline the role of various components of computer system.	3	3		2				3	2	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Identify micro-operations.	3	3	2	2				2	2	3		3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Comment on the design of Combinational & Sequential circuits	3	3	3	2				3	2	3		3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1909 : (Object Oriented Programming using C++)

CO No.	CO Statements (UC-UGCA1909: Object Oriented Programming using C++)	PO-a	PO-b	PO-c	PO-d	PO-e	PO-f	PO-g	PO-h	PO-i	PO-j	PSO-k	PSO-l	PSO-m	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
		Basic knowledge	Discipline knowledge	Experiments and practice	Tools Usage	Profession and society	Environment and sustainability	Ethics	Individual and team work	Communication	Life-long learning	Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.			
CO1	Outline the role of programming for solving real world problems.	3	2	3	2	2	2			2	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Explain Object oriented approach for finding Solutions to various problems with the help of C++ language.	3	3	3	3	2	2	1	2	2	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Implement computer based solutions to various real-world problems using C++	3	3	3	3	2	2	1	3	3	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Select the right Object Orieted Concept for optimal solution.	3	3	3					2	3	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Review different solutions for a common problem.	3	3	3	2				2	3	3	3	3	3	Review	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1910 : (Object Oriented Programming using C++ Laboratory)

CO No.	CO Statements (UC-UGCA1910: Object Oriented Programming using C++ Laboratory)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainabil	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO1	Design the classes.	3		3	2				2		3	2	3		Design	Employability	Practical Assignments
CO2	Illustrate the concept of memory representation for objects	3	2	3					2	2	3	2	3		Design	Employability	Practical Assignments
CO3	Implement programs using OOP concepts for various problems.	3	3	3	3	2	2	1	2	3	3	3	3	3	Design	Employability	Practical Assignments
CO4	Implement file handling in C++	3	2	3	3				2		3	3	3	3	Design	Employability	Practical Assignments
CO5	Select the right data types to represent class properties.	3	2	3					2	2	3	3	3	3	Design	Employability	Practical Assignments

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Program Bachelor of Computer Applications (BCA)
UGCA1914 : (Programming in Python)

CO No.	CO Statements (UC-UGCA1914: Programming in Python)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ deisgn etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Explain environment, data types, operators used in Python.	3	2	3	2	2	2	1	2	2	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Compare Python with other programming languages.	3	3	3	3				2	2	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Outline the use of control structures and numerous native data types with their methods.	3	3	3	3				3	3	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Design user defined functions, modules, files, and packages and exception handling methods.	3	3	3	3				2	3	3	3	3	3	Design	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Write solutions for Object Oriented Programming Concepts.	3	3	3	2				2	3	3	3	3	3	Understand	Employability	MSTs, ESE, Class/Quiz Tests

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Program Bachelor of Computer Applications (BCA)
UGCA1915 : (Data Structures)

CO No.	CO Statements (UG-UGCA1915 : Data Structures)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Apply appropriate constructs of Programming language, coding standards for application development.	3	3	1				2	2	2	3	3	2		Understanding	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Select appropriate data structures for problem solving and programming	3	3	1					3	3	3	3	2	2	Understanding	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Illustrate the outcome of various operations on data structures.	3	3	3	2				2	3	3	3	2	2	Understanding	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Identify appropriate searching and/or sorting techniques for wide range of problems and data types.	3	3	3	3				3	3	3	3	2	2	Understanding	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Differentiate between various types of data structures	3	3	3	3				3	2	3	3	3	2	Understanding	Employability	MSTs, ESE, Class/Quiz Tests

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Department Computer Science and Engineering
Program Bachelor of Computer Applications (BCA)
UGCA1923 : (Operating Systems)

CO No.	CO Statements (UC-UGCA1923: Operating Systems)	PO-a Basic knowledge	PO-b Discipline knowledge	PO-c Experiments and practice	PO-d Tools Usage	PO-e Profession and society	PO-f Environment and sustainability	PO-g Ethics	PO-h Individual and team work	PO-i Communication	PO-j Life-long learning	PSO-k Explore technical comprehension in varied areas of Computer Applications to help attain skills to purse thriving career and higher studies.	PSO-l Comprehend, explore and build up computer programs in the allied areas like Algorithms, System Software, Web Design and Data Analytics.	PSO-m Able to use latest trends in technology development and thereby build innovate new ideas and solutions to varied problems.	Learning Level(understand/analyse/ design etc)	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1	Discuss the evaluation of operating systems.	3							1		3	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO2	Explain different resource managements performed by operating system	3	2	2					1	2	3	2			Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO3	Describe the architecture in terms of functions performed by different types of operating systems.	3	2	2					2	2	3	3	2	2	Understand	Employability	MSTs, ESE, Class/Quiz Tests
CO4	Analyze the performance of different algorithms used in design of operating system components.	3	3	3	2				2	2	3	3	2	2	Analyse	Employability	MSTs, ESE, Class/Quiz Tests
CO5	Compare the key properties of different types of Operating Sysytems.	3	3	2					2	2	3	3	3		Understand	Employability	MSTs, ESE, Class/Quiz Tests

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