Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2022-23

Doc No : BITACAD/CO-POMapping/COMP/Odd/2022-23

Session	**ODD SEMESTER**

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**										**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**
2022-23	Engineering Mathematics – III (BTBS301)	**1**	Understand the concept of Laplace transform and inverse Laplace transform of elementary functions and apply it to solve the linear differential equations with constant coefficients having their applications in mechanical, electrical, chemical, communication etc. systems.	3	2									1	
		2	Apply the concept of Fourier transform to solve the boundary value problems, problems in signal processing and communication system.	2	2									2	
		3	Apply partial differential equations to solve heat equation, wave equation and Laplace equation etc.	3	2									1	
		4	Analyze conformal mapping, transformation and perform contour integration of complex function in the study of electromagnetics and signal processing.	3	2									2	

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				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**
2022-23	Discrete Mathematics (BTCOC302)	**1**	To understand the basic principles of sets and operations	3	3		1			3			2	1	
		2	To demonstrate an understanding of relations and functions and to determine their properties.	3	3	1				2				1	
		3	To model problems in Computer Science using graphs.		3					3				2	
		4	To model problems in Computer Science using trees.	3						3			2	2	
		5	To understand various algebraic structures and their properties.	3	3									2	

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				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**
2022-23	Data Structures (BTCOC303)	**1**	To understand the basic terminologies of Data Structures, arrays and Hashing	2			2							1	
		2	To understand and implement stacks, queues data structures and their applications	3	1		2							2	2
		3	To design and implement various types of linked lists and its various applications	2			1							2	2
		4	To implement concepts from trees and graphs to explore algorithms based on them.	3	2	2	3							2	2
		5	To understand, apply and evaluate various searching and sorting techniques.	2			2							2	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Computer Architecture & Organization (BTCOC304)	1	To understand the basic hardware and software issues of computer organization			3				3			3	1	
		2	Identify functional units,bus structure and addressing modes.			3				3			3	1	
		3	Students will be able to identify where,when and how enhancements of computer performance can be accompolished.				2			2			2		1
		4	Identify memory hierarchy and performance.			2	1								
		5	To understand control unit design and input/output organization and pipelining.							3			3		

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				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective –I (A) Object Oriented Programming in C++ (BTCOC 305)	1	Demonstrate the features of object oriented programming approach and basic constructs of C++.			3		1						3	2
		2	Implement modular programming using functions and its overloading.	1		3	3	1						3	2
		3	Formulate user define data type using classes and objects.	1		3	3	1						3	2
		4	Discuss various methods to initialize an object using constructors and destructors.			3	3							3	2
		5	Illustrate the concepts of friend functions and polymorphism using operator overloading. To choose and design reusable applications.			3	2							3	2

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				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective –I (B) Object Oriented Programming in Java (BTCOC305)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects.			3								3	2
		2	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.			3								3	2
		3	Understand and build applications using Arrays.			3	2							3	2
		4	Design and build applications using Inheritance and Polymorphism.			3	3	1					2	3	2
		5	Make use of Exception-handling to build the robust applications and demonstrate the use of Java script for client-side scripting			3	3						2	3	2

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				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Data Structures Lab & Object Oriented Programming in Java(BTCOL306)	1	To understand the basic terminologies of Data Structures, arrays and Hashing	2			2							2	2
		2	To understand and implement stacks, queues data structures and their applications	3	1		2							2	2
		3	To design and implement various types of linked lists and its various applications	2			1							2	2
		4	To implement concepts from trees and graphs to explore algorithms based on them.	3	2	2	3							2	2
		5	To understand, apply and evaluate various searching and sorting techniques.	2			2							2	2
		1	Understand the principles of object-oriented concepts, create classes, instantiate objects.			3								3	2
		2	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.			3								3	2
		3	Understand and build applications using Arrays.			3	2							3	2
		4	Design and build applications using Inheritance and Polymorphism.			3	3	1					2	3	2
		5	Make use of Exception-handling to build the robust applications and demonstrate the use of Java script for client-side scripting			3	3						2	3	2

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2022-23	Seminar-I (BTCOS307)	1	State the exact title of the seminar	2					2	2	2	2	1	1	3
		2	Explain the motivation for selecting the seminar topic and its scope								2		2	1	3
		3	Search pertinent literature and information on the topic	2					1	1	1	3	3	3	3
		4	Critically review the literature and information collected	2		1			2	1	2	2	2	2	3
		5	Demonstrate effective written and verbal communication										3		3

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2022-23	Field Training / Internship / Industrial Training Evaluation (BTES211P)	1	To provide industrial exposure to student to experience the real world problems through short industry projects				2						1	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations				2						1	3	3
		3	To identify gap in existing knowledge to help develop a specialization				2						1	3	3
		4	To create awareness about technical report writing among the student.				2				3		1	3	3

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2022-23	Database Systems (BTCOC501)	1	Model, design databases for real life applications and depict a database system using E-R Diagram			3	1			3			3	3	
		2	To learn data models, conceptualize and depict a database system Relational Algebra and Calculus			3	1			3			3	3	
		3	Query database application using Query languages like SQL and assessing SQL from Programming Language.			3	1		2	3			3	3	
		4	Understand validation framework using Normalization and apply File Organization, Indexing & Hashing			3	1	2	1	3		1	3	3	
		5	Understand transaction concepts and techniques.			3	1	2		3		1	3	3	

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2022-23	Theory of Computations (BTCOC502)	1	TO UNDERSTAND THE DIFFERENCE BETWEEN DETERMINISM AND NON DETERMINISM OF STATE MACHINES.	3	3		2								3
		2	TO UNDERSTAND THE GRAMMAR NOTIONS IN COMPUTER SYSTEMS	3	3								1		3
		3	TO APPLY THE CONCEPT OF PARSE TREE IN COMPILER GENERATION. BL2 UNDERSTAND	3	3		2						2		3
		4	DEMONSTRATE THE PUSH DOWN AUTOMATON MODEL FOR THE GIVEN LANGUAGE	2	1		3								3
		5	MAKE USE OF TURING MACHINE CONCEPT TO SOLVE THE SIMPLE PROBLEMS	3	3		2								3

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2022-23	Software Engineering (BTCOC503)	1	To understand the software processes and various software process model's applicability along with the ethical practices to be followed .			1	2	2				1		3	1
		2	To be able to analyse software requirements using requirement engineering process and develop SRS document for a project.		2	1				2	1			3	1
		3	To be able to apply various system and architectural modelling techniques to a software project.				1	1	1					2	
		4	To gain knowledge of software design with object oriented design approach, design patterns and its methodology.	1	1	2	2							3	
		5	To distinguish between different testing strategies and its applicability in various software processes allong with Impact of the non functional attributes				1	1						3	

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2022-23	Elective II(A): Human Computer Interaction (BTCOE504)	1	[HCCO1] Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.	1										3	
		2	[HCCO2] Describe the key design principles for user interfaces.			2		3	2					3	
		3	[HCCO3] Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems.			2	3		2					3	
		4	[HCCO4] Develop and implement a process to gather requirements for, engage in iterative design of, and evaluate the usability of a user interface.				2	2	1					3	
		5	[HCCO5] Demonstrate and knowledge of human computer interaction design concepts and related methodologies. with effective work design to real-world application.									2	2	3	

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2022-23	Elective II(B): Numerical Methods (BTCOE504)	1	CO1: Apply numerical methods to solve equations.	3	3		2							1	2
		2	CO2: Solve linear simultaneous equations using different methods.	3	3		2							1	2
		3	CO3: Approximate and interpolate functions using finite differences and interpolation formulas.	3	3		2							1	2
		4	CO4: Perform numerical differentiation and integration using various techniques.	3	3		2							1	2
		5	CO5: Solve ordinary differential equations using numerical methods.	3	3		2							1	2

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2022-23	Elective III(A): Economics & Management (BTHM505)	1	Analyze market equilibrium, elasticity of demand, and cost-volume-profit relationships					1						-	-
		2	Analyze financial statements for variance analysis and budgeting					2						-	-
		3	Compare alternative investment options					2						-	-
		4	Apply depreciation accounting methods					2						-	-
		5	Understand the process of product development											-	-

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				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective – III(B) Business Communication (BTCOE505)	1	Develop communication competence of the students.										3	-	-
		2	Understand international market and Inter-Cultural Communication.									2		-	-
		3	Analyze and overcome barriers of communication										3	-	-
		4	Understand and practice better interpersonal communication										2	-	-
		5	Develop leadership skills and team spirit.									3		-	-
		6	Apply negotiation skills and ethics in Business Communication.								2			-	-

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				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Database Systems & Software Engineering Lab (BTCOL506)	1	Model, design databases for real life applications and depict a database system using E-R Diagram and learn data models.						3			3	3	3	
		2	To conceptualize and depict a database system Relational Algebra and Calculus						3			3	3	3	
		3	formulate SQL queries on the respect data and Understand validation framework using Normalization.						3					3	
		4	To understand Query processing.						3			3	3	3	
		5	To understand File Organization, Indexing & Hashing						3					3	
		6	To Understand transaction concepts and techniques.						3				3	3	
		1	To understand the software processes and various software process model's applicability along with the ethical practices to be followed .			3					3		3	3	2
		2	To be able to analyse software requirements using requirement engineering process and develop SRS document for a project.			3					3		3	3	2

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2022-23	Mini Project-I (BTCOM507)	1	State the exact title of the project and problem definition	1	1								1	3	
		2	Explain the motivation, objectives and scope of the project									1	2	3	
		3	Review the literature related to the selected topic of the project		1				1					3	
		4	Design the mechanism, components of the system and prepare detailed drawings.			3	2	2		1		1	1	3	3
		5	Evaluate the cost considering different materials/manufacturing processes	1		1					1				3

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				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Field Training / Internship / Industrial Training Evaluation (BTCOF408)	1	To provide industrial exposure to student to experience the real world problems through short industry projects				2						1	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations				2						1	3	3
		3	To identify gap in existing knowledge to help develop a specialization				2						1	3	3
		4	To create awareness about technical report writing among the student.				2				3		1	3	3

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				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Software Engineering (BTCOC701)	1	To understand the software processes and various software process model's applicability along with the ethical practices to be followed .		2	3	2				2			2		3	1
		2	To be able to analyse software requirements using requirement engineering process and develop SRS document for a project.		2				2			2	2	2		3	1
		3	To be able to apply various system and architectural modelling techniques to a software project.			2	1	1								2	
		4	To gain knowledge of software design with object oriented design approach, design patterns and its methodology.	1	1	2										3	
		5	To distinguish between different testing strategies and its applicability in various software processes.			2	1	1								2	
		6	Recognize the importance of non functional aspects and its impact on software engineering.		1	2			1							2	

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2022-23	Elective - VIII (A) Big Data Analytics (BTCOE702)	1	To understand and study the basic technologies that forms the foundations of Big Data.	1	2	2	2									1	
		2	To study the programming aspects with a view to big data applications.		2	2	2	1								1	1
		3	To understand and evaluate big data streaming ecosystem				2	1								1	1
		4	To understand the specialized aspects of big data including big data application, and big data analytics		2	2	2									1	1
		5	To understand, apply and create query processing on MongoDB	1			3	2								2	3

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2022-23	Elective - VIII (B) Distributed System (BTCOE702)	1	Define basic terminology of Distributed System.	3				2									3
		2	Appreciation of the fundamentals, advantages, and challenges in designing and implementing distributed systems.	3	2			1									3
		3	Appreciation of the differences in the handling of issues like mutual exclusion, deadlock detection, fault handling, etc. in a centralized system and a distributed system.	3	2			1									3
		4	Ability to write distributed programs using sockets, RPC/RMI, etc	3	2			1									3
		5	Ability to make intelligent choices from among available algorithms and techniques for the design of distributed systems subject to specific design and performance constraints.	3	2			1									3

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2022-23	Elective - VIII (C) Fundamental of Digital Image Processing (BTCOE702)	1	To understand the fundamentals of digital imaging and image transformation techniques.	1											2		
		2	Apply image enhancement techniques in both the spatial and frequency (Fourier) domains.				2	2								2	1
		3	Analyze the basic algorithms used for image compression & restoration.	1				2								2	1
		4	Apply image segmentation techniques to partition an image into its constituent parts or objects.	2		3		3								2	1
		5	Make use of techniques, skills, and modern engineering tools necessary for engineering application to real problems			2		2									

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2022-23	Elective - IX(A) - Cloud Computing (BTCOE703)	1	To understand the different levels of virtualization in the cloud system and its application in scenario specification.	3				2			2						3
		2	To understand and apply cloud services in reference to cloud models.	3				2	1								3
		3	To understand the scaling methods and to apply proper measures by analyzing the scenario.	3			2	2									3
		4	To understand and use of Aneka as a public , private and hybrid cloud model.	3			2	2									3
		5	To understand the role of cloud serves from competitors and applications view.	3			2	3			3						3

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2022-23	Elective - VIII (B) - Business Intelligence (BTCOE703)	1	Understanding the need for BI with Practical skills in Business Intelligence and Decision Support to utilize the most current software products in everyday decision making; Describe the concepts and components of Business Intelligence (BI).				1			1	1					3	
		2	Understanding the BI techniques development to Understand and design the technological architecture that underpins BI systems.	2	2		1									3	
		3	Apply theoretical concepts of the course to the decision-making and BI processes and technologies in order to prepare students for making appropriate managerial decisions in future real-life situations. Through applying the practices to understand how “text book theory” works “in today’s business practices”.	1	1	1	2									3	
		4	Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of Online analytical processing (OLAP)).	1	2		2	1								3	
		5	Design Data warehouse models using appropriate schemas to meet business objectives and Apply data analysis techniques for building Decision Support System.	1	1	3	1					1		2		3	

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2022-23	Elective - VIII (C) - Natural Language Processing (BTCOE703)	1	Students will be able to understand the fundamental concepts of Natural Language Processing	2	2	3	2										1
		2	Students will be able to design algorithms for NLP tasks		2	3										3	2
		3	Students will be able to develop useful systems for language processing and related tasks involving text processing		2	3										3	2

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2022-23	Open Elective - X (A) Blockchain Technology (BTCOE704)	1	Illustrate the essential concepts of blockchain technology		1	1	1									2	2
		2	Explain the functioning of bitcoin cryptocurrency and various consensus algorithms.	1	2	2	2	2								2	2
		3	Distinguish between different types of blockchain and evaluate different consensus models for permissioned blockchain		1	1	1									2	2
		4	Assess different types of uses of blockchain and analyze its implementation in real-life scenarios		2	2	2	2					1			3	2
		5	Develop smart contract/chaincode using Hyperledger Fabric and Ethereum	1	2	2	2	2								3	3

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2022-23	Open Elective - X (B) Computer Graphics (BTCOE704)	1	Understand the basics of computer graphics, different graphics systems, devices, and applications of computer graphics.	1		1										1	
		2	Discuss various 2D transformation algorithms and different clipping techniques.	1		2		2								1	
		3	Understand various 3D transformations and projections techniques.	1		2		2								1	1
		4	Design Graphicaal User Interface using various graphics designing tools		1	3		2							1		1
		5	Explore fundamentals of animation and discuss its types			3	1								1		1

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2022-23	Open Elective - X (C) Embedded Systems (BTCOE704)	1	Understand the fundamentals of embedded systems, including the design challenges, processor technology, and IC technology.	3	1	1	1	2	-	-	2	1	-	-	-	2	1
		2	Analyze and design custom single-purpose processors, including hardware-combinational logic, sequential logic, and RT-level design.	1	2	-	-	-	-	-	2	1	-	-	-	2	2
		3	Gain knowledge of system control in embedded systems, including pin and register description, memory mapping control, and power control.	1	1	2	1	1	-	-	1	-	-	-	-	1	1
		4	Explore the functionality and operation of communication interfaces such as UART, SPI, and I2C in embedded systems.	-	-	-	2	1	-	-	-	-	-	-	-	3	2
		5	Develop an understanding of process scheduling in embedded systems, including real-time operating systems (RTOS) and system design using simulation software.	2	-	-	1	2	-	-	2	1	-	-	-	2	1

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2022-23	Open Elective - X (D) Design Thinking (BTCOE704)	1	Gain a comprehensive understanding of the design thinking process, its models, phases, and its correlation with other philosophies. Develop knowledge of design thinking tools and their application in problem-solving, emphasizing the importance of design thinking in the business context of innovation.			2		1			1		2		1	2	
		2	Learn the role of empathy in design thinking and develop skills in empathizing with users. Acquire techniques for creating empathy maps, user personas, and customer journey mapping. Formulate effective "How might we" questions to drive the design thinking process.			1		1				1	2			1	1
		3	Develop analytical skills for root cause analysis, conflict of interest analysis, and perspective analysis in the context of design thinking. Explore big picture thinking through system operator and function modeling. Apply brainstorming techniques, metaphors, and ideation tools such as CREATE and What-If. Introduce the principles and applications of TRIZ for inventive problem-solving.		1	2	1	2			1	1			2	1	2
		4	Acquire practical skills in prototyping and validation within the design thinking process. Understand the assumptions involved and learn best practices for presenting and testing prototypes in the market.			1	2	2				1	1			1	2
		5	Understand the benefits of iteration in the design thinking process and its role in fostering design innovation. Learn how to effectively take ideas to the market and gain an introduction to innovation management within a company.				1					1	1			2	2

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2022-23	Full stack Development Lab (BTCOL705)	1	Implement the Web development features like finding Geolocation, saving Session information, Adding audio and video etc.	1	2	2										2	
		2	Implement the basic web elements and its design using HTML5, CSS and advance CSS properties.	1	2	2										2	
		3	Understand the concepts of programming and problem solving through HTML & JavaScript.		1	1										2	1
		4	Understanding the basic concepts of PHP and its applications.		2	2		1								2	1
		5	To design and develop dynamic, database-driven web applications using PHP.	2	3	3	2	2								2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	System Administration Lab (BTCOL706)	1	To install & configure various linux flavours (8hr)	2				2								1	
		2	To install SSH and telnet server on ubuntu					2					1			1	
		3	To install FTP server on ubuntu & perform Uploading/Downloading	3				3					2			1	
		4	To install & configure http and proxy server on ubuntu	2				2								1	
		5	To install & configure samba server on ubuntu	2				2								1	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective VIII Lab: Big Data Analytics Laboratory (A) (BTCOL707)	1	Understanding of Big Data and its technologies.(8hr2Pr)	1	2	2										1	1
		2	Ability to understand, apply, analyze and create Programs on Big Data Platforms (4 hr 2 pr)		2	2	2									1	2
		3	Ability to understand, apply and analyze Big Data Applications (2hr 1 pr)		2	2	2									1	2
		4	Ability to understand, apply and analyze Database for the Modern Web (6 hr 3 pr)	1		2	3	2								1	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective VIII Lab: Distributed System Lab (B) (BTCOL707)	1	Apply the concepts of Remote Procedure Call (RPC) and Remote Method Invocation (RMI).	3												2	2
		2	Design and implement distributed applications using message passing interfaces, synchronization algorithms, and multi-threaded client/server processes.	3		3		1								2	2
		3	Configure and test server socket options, such as SO_KEEPALIVE, SO_LINGER, SO_SNDBUF, SO_RCVBUF, and TCP_NODELAY.	3		2		1								2	2
		4	Implement shared memory operations, including incrementing a counter, and study the implementation of Election and Mutual Exclusion algorithms.	3		3		1								2	2
		5	Develop Network File System (NFS) and demonstrate its functionality.	3		3		1								2	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective VIII Lab: Fundamental of Digital Image Processing (C) (BTCOL707)	1	To understand the fundamentals of digital imaging and image transformation techniques.	1											2		
		2	Apply image enhancement techniques in both the spatial and frequency (Fourier) domains.				2	2								2	1
		3	Analyze the basic algorithms used for image compression & restoration.	1				2								2	1
		4	Apply image segmentation techniques to partition an image into its constituent parts or objects.	2		3		3								2	1
		5	Make use of techniques, skills, and modern engineering tools necessary for engineering application to real problems			2		2									

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective IX Lab: Cloud Computing Laboratory (A) (BTCOL708)	1	To understand the different levels of virtualization in the cloud system and its application in scenario specification.	3				2			2						3
		2	To understand and apply cloud services in reference to cloud models.	3				2	1								3
		3	To understand the scaling methods and to apply proper measures by analyzing the scenario.	3			2	2									3
		4	To understand and use of Aneka as a public , private and hybrid cloud model.	3			2	2									3
		5	To understand the role of cloud serves from competitors and applications view.	3			2	3			3						3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective IX Lab: Business Intelligence Laboratory (B) (BTCOL708)	1	Understanding the need for BI with Practical skills in Business Intelligence and Decision Support to utilize the most current software products in everyday decision making; Describe the concepts and components of Business Intelligence (BI).				1			1	1					3	
		2	Understanding the BI techniques development to Understand and design the technological architecture that underpins BI systems.	2	2		1									3	
		3	Apply theoretical concepts of the course to the decision-making and BI processes and technologies in order to prepare students for making appropriate managerial decisions in future real-life situations. Through applying the practices to understand how “text book theory” works “in today’s business practices”.	1	1	1	2									3	
		4	Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of Online analytical processing (OLAP)).	1	2		2	1								3	
		5	Design Data warehouse models using appropriate schemas to meet business objectives and Apply data analysis techniques for building Decision Support System.	1	1	3	1					1		2		3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective IX Lab: Natural Language Processing (C) (BTCOL708)	1	Students will be able to understand the fundamental concepts of Natural Language Processing	2	2	3	2										1
		2	Students will be able to design algorithms for NLP tasks		2	3										3	2
		3	Students will be able to develop useful systems for language processing and related tasks involving text processing		2	3										3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Project Phase-I (BTCOP709)	1	Plan and manage a major project effectively, including setting goals, creating timelines, managing resources, and coordinating project activities.	1	1	2		1	1			3	3	3		3	
		2	Analyze and solve complex engineering problems in the context of the major project using appropriate analytical techniques, algorithms, and tools.	3	3		3	3			3				3	3	
		3	Design and develop innovative and practical solutions for software/hardware systems, considering factors such as performance, security, usability, and maintainability.	2	3	3	3	3							3	3	
		4	Work collaboratively in multidisciplinary project teams, communicate project requirements, progress, and outcomes effectively, and deliver presentations and documentation.				2		3	-	3	3	3	3		3	3
		5	Adhere to ethical guidelines and professional standards in conducting the major project, considering aspects such as privacy, security, intellectual property, and social impact.						3	3	3		3				3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Field Training / Internship / Industrial Training (BTCOF609)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2022-23 **Doc No : BITACAD/CO-POMapping/COMP/Even/2022-23**

Session	Even SEMESTER													
	Course/Subject			Program Outcomes (POs)										PSOs	
	with course code		Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Design & Analysis of Algorithms (BTCOC401)	1	Analyzing the time complexity of a given algorithm and data structure operations.	3			2							1	
		2	Analyze and Design algorithms using divide and conquer approach.	3	2		2							2	2
		3	Analyze and Design algorithms using backtracking and branch and bound techniques.	2			2							2	2
		4	Analyze and Design algorithms using a greedy approach.	2	2	2	2							2	2
		5	Analyze and Design algorithms using dynamic programming and distinguish between P and NP classes of problems.	2			2							2	2
	Course/Subject			Program Outcomes (POs)										PSOs	
	with course code		Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Operating Systems (BTCOC402)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation	3	2	2	2						3	1	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system	2	2	3	3							1	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and	3	3	2	2			3				1	
		4	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts	3	2	2	2							1	
		5	Explain concept of File systems used in operating system, classify the access methods and disk arm scheduling strategies	3	3	3	3	3						1	
	Course/Subject			Program Outcomes (POs)										PSOs	
	with course code		Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Basic Human Rights (BTHM403)	1	Understand the history of human rights.								2	3		-	-
		2	Learn to respect others caste, religion, region and culture.								2	3		-	-
		3	Be aware of their rights as Indian citizen.								1	3		-	-
		4	Understand the importance of groups and communities in the society.								1	2		-	-
		5	Realize the philosophical and cultural basis and historical perspectives of human rights.								1	3		-	-
		6	Make them aware of their responsibilities towards the nation.								1	3		-	-

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Probability Theory and Random Processes (BTBS404)	1	apply Baye's theorem, basic probability axioms and rules to solve the problems, also they apply problem-solving techniques to solving real-world events.	1	3		2							2	
		2	calculate probabilities; derive the marginal and conditional distributions of bivariate random variables.	1	3		2							2	
		3	apply selected probability distributions (binomial, Poisson and normal) to solve problems.	1	3		2							1	
		4	calculate the correlation between two variables and simple linear regression equation for the set of data, also they apply the principles of linear regression and correlation (including least square method) and predict the particular value of Y for given value of X and significance the correlation coefficient.		2									2	
		5	perform the test of significance and calculate difference of proportions, single mean, difference of means, and difference of standard deviations.		3									1	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Digital Logic Design & Microprocessors (BTES405)	1	Understand the fundamental concepts and structure of various number systems and its applications along with concepts of digital electronics.	3										2	1
		2	Ability to understand, analyse and design various combinational circuits	3										3	2
		3	Ability to understand, analyse and design various sequential circuits	3										3	2
		4	Understand the internal architecture of microprocessors along with fundamental concepts of 8,16 and 32 bit microprocessors.		2				1					2	1
		5	Understand the concepts of memory and its interfacing with microprocessors.	3		1			1					2	1
		6	Apply knowledge and demonstrate programming proficiency using various logical, arithmetic and data transfer instructions of the target microprocessor.			2			2				1	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Operating System Lab & Python Programming Lab (BTCOL406)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and							3			3	2	
		4	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3	2	
		5	Explain concept of File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3	1	
		1	Understand the concepts of programming and problem solving through python programming	3	3	2	3	3					2	3	3
		2	Implement the basic constructs of programming language like variables, loops, assignments, strings etc.	3	3	2	2	3					2	3	1
		3	Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.	3	2	2	3	3					2	3	1
		4	Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.	3	3	3	2	3					2	3	1
		5	Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems.	2	1	2	1	3					2	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Seminar – II (BTCOS407)	1	Design HTML pages using HTML tags					3	3		2			2	
		2	Design HTML pages using CSS.					3	3		2			2	
		3	Implement the concept of javascript for designing interactive web pages.			2		3	3					2	1
		4	Implement PHP as a server side scripting language.			2	1	3	3	1	1		1	2	1
		5	Use jQuery and AJAX to create dynamic interactive websites that communicate with a backend server.			2	1	3	3	1			1	2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Compiler Design (BTCOC601)	1	Discuss the major phases of compilers and use the knowledge of the Lex tool			2	2						3		3
		2	To understand and apply the logic of assembling a NFA from regular expression.	1	3								3		3
		3	To understand and differentaite the logics behind top down paring and bottum up parsing		1	2	2						3		3
		4	Describe intermediate code representations using syntax trees and DAG's.				2						3		3
		5	Summarize various optimization techniques used for dataflow analysis and generate machine code from the source code of a novel language.				2						3		3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Computer Networks (BTCOC602)	1	Develop an understanding of modern network architectures , study protocols, network standards, the OSI model,TCP/IP model.							3			3	1	1
		2	Study different LAN,WI-FI and Wireless technologies.							3			3	1	1
		3	Study different error correcting and detecting codes.	2		1	1			3			3	1	1
		4	Study IP addressing scheme , routing algorithms ,ability to write program using socket programming.	1		2				3			3	1	1
		5	Study different application protocols and understand basic concepts of network security using cryptographic techniques.				3	3		3			3	3	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Machine Learning (BTCOC603)	1	Understand the basic concepts and different models of learning.	1	1	1	2	2							
		2	Apply basic machine learning algorithms like regression and classification.		2	2	1							2	1
		3	Understand and apply artificial neural network to real world problems.			2	3	1						2	1
		4	Design hybrid machine learning model.		1		3	1						2	1
		5	Demonstrate unsupervised learning using clustering.		1		3	1						2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective – IV (A) Geographic Information System (BTCOE604)	1	Understand basic concepts associated with GIS	1										3	3
		2	Understand apply and differentiate vector, raster and TIN		2									2	3
		3	Understand Digital Elevation Model (DEM), its resolutions and apply preprocessing techniques.		2	2								2	3
		4	Analyze Digital Elevation Model (DEM) and enhance its quality		2		2	2		1			2	1	3
		5	Application of GIS tools for identification of errors.	1	2		3	3		2			2	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective – IV (B) Internet of Things (BTCOE604)	1	Understand and describe basics of IoT and able to identify the components that forms a part of Architecture.	2										2	1
		2	Understand the concept of sensors and actuators in terms of "Things" in IoT and role of Communication Technologies.					2		2			2	2	1
		3	Understand and evaluate appropriate communication protocol for IoT systems.	1			3			-			1	2	1
		4	Understand and appreciate the roll of Machine Learning, Big Data, and Data Analytics in IoT systems.	2		2	3	2		1				2	2
		5	Apply the knowledge and skill acquired to build and test a complete working IoT system involving prototype programming	1		3	2	3		1			2	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective – IV (C) Embedded Systems (BTCOE604)	1	Understand the fundamentals of embedded systems, including the design challenges, processor technology, and IC technology.	2	1			1		1	1		1	1	2
		2	Analyze and design custom single-purpose processors, including hardware-combinational logic, sequential logic, and RT-level design.				2			2	1		0	1	2
		3	Gain knowledge of system control in embedded systems, including pin and register description, memory mapping control, and power control.				1			1			0	1	2
		4	Explore the functionality and operation of communication interfaces such as UART, SPI, and I2C in embedded systems.			1	2	1		1			1	1	2
		5	Develop an understanding of process scheduling in embedded systems, including real-time operating systems (RTOS) and system design using simulation software.				2	2		1	1		2	1	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective – V (A) Development Engineering (BTHM605)	1	Demonstrate understanding of the principles of Development Engineering				1	3				2		1	2
		2	Understand the state of poverty in India via various human development indexes and understand the role of the engineer in sustainable development and engineering ethic		2		2	3				2		2	3
		3	Analyse the social justice system for the parameters of human dignity, equal rights and social inclusion, alongwith environmental justice and be able to explain how social philosophies impact appropriateness and sustainability of engineering solutions					3			3	3		2	3
		4	Learn about implementation of development strategies via perspactive of social, technological, economic, health, education and business					3				2		1	2
		5	Apply Engineering knowledge and skills to a real world humanitarian problem via participatory development through a technically designed projects, considering complex social factors and the unique need of stakeholders and present the result in both verbal and written form					3	2		3	2		3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective – V (B) Employability and Skill Development (BTHM605)	1	To understand and apply Soft Skills & Communication basics								3	1		2	
		2	Apply Arithmetic and Mathematical Reasoning and Analytical Reasoning and Quantitative Ability			2	3								1
		3	Understand and apply Grammar and Comprehension			2					3				
		4	Demonstrate varoius Skills for interviews								3	1		1	
		5	Understand and Apply Problem Solving Techniques			2	3					2			2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Elective – V (C) Consumer Behaviour (BTHM605)	1	Understand the scope, application, importance and evolution of consumer behaviour					1							
		2	Learn market segmentation and understand the consumer decision making process that leads to buying				1	1						1	
		3	Learn about models of consumer behavior				1								
		4	Be aware about the psychological and sociological influences on consumer decision making											1	
		5	Understand organizational buying				1							1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Competitive Programming-I &Machine Learning (BTCOL606)	1	Understand online judge platform and use it for program evaluation	2	3										2
		2	Apply Elementary Data Structures to solve programming problems			2	3							2	2
		3	Apply strings to solve programming problems			2	1							2	2
		4	Apply Sorting technics to solve programming problems			2	1							2	2
		5	Apply Arithmetic and Algebra to solve programming problems	2	3									2	2
		1	Understand the basic concepts and different models of learning.	1	1	1	2	2							
		2	Apply basic machine learning algorithms like regression and classification.		2	2	1							2	1
		3	Understand and apply artificial neural network to real world problems.			2	3	1						2	1
		4	Design hybrid machine learning model.		1		3	1						2	1
		5	Demonstrate unsupervised learning using clustering.		1		3	1						2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2022-23	Mini Project-II (BTCOM607)	1	State the exact title of the project and problem definition	1	1								1	3	
		2	Explain the motivation, objectives and scope of the project									1	2	3	
		3	Review the literature related to the selected topic of the project		1				1					3	
		4	Design the mechanism, components of the system and prepare detailed drawings.			3	2	2		1		1	1	3	3
		5	Evaluate the cost considering different materials/manufacturing processes	1		1					1				3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective XI(A): Deep Learning (BTCOE801)	1	Understand the fundamental concepts and principles of machine learning, including feature descriptors, Bayesian learning, and discriminant functions.	3	2	-	-	-	-	-	-	-	-	-	-	2	-
		2	Apply linear classifiers, support vector machines, and optimization techniques in machine learning to solve classification problems.	2	3	3	3	-	-	-	-	-	-	-	-	2	-
		3	Comprehend the basics of neural networks, including multilayer perceptrons, backpropagation learning, and loss functions.	2	3	3	3	2	-	-	-	-	-	-	-	2	-
		4	Explore the capabilities and applications of autoencoders, including their comparison with principal component analysis (PCA) and different variants of autoencoders.	2	3	3	3	2	-	-	-	-	-	-	-	2	-
		5	Gain knowledge of convolutional neural networks (CNNs) and their architectures, including popular models like LeNet, AlexNet, VGG16, and GoogleNet.	2	3	3	3	2	-	-	-	-	-	-	-	3	2
		6	Familiarize oneself with advanced topics in deep learning, such as optimization algorithms, normalization techniques and various applications	2	3	3	3	2	-	-	-	-	-	-	-	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective XI(B): Social Networks (BTCOE801)	1	Understand network analysis fundamentals and apply basic techniques using Python and Networkx.	3	3	1											3
		2	Apply the network concepts such as homophily and structural balance of the network using Networkx.	3			3	3								3	
		3	Explore social network structures, dynamics, and simulate social phenomena using relevant models.	3			3									3	
		4	Apply advanced techniques in network community detection and interpret communities using Gephi.	3	3	3	3									3	
		5	Investigate balanced networks, relationship dynamics, and implement algorithms for network transformation.	3		3	3									3	
		6	Understand PageRank and diffusion in networks, analyze their impact, and model information spread.	3	3	1	3	3								3	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Elective - XI (C) BTCOE801 (C): Randomized Algorithms	1	CO1: Understand randomized algorithms and their applications.	2	2	1	1	1			1	1	2		3	3	3
		2	CO2: Apply probability concepts to analyze randomized algorithms.	3	3	1	2	1			1	1	3		3	2	3
		3	CO3: Explore advanced topics in randomized algorithms.	2	2	2	2	1			1	1	2		3	3	3
		4	CO4: Analyze and design efficient algorithms for permutation routing.	2	2	3	3	2	1	1	2	2	2	1	3	3	3
		5	CO5: Gain knowledge of computational complexity concepts.	1	1			1					1		2	2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Open Elective XII (A): Introduction to Industry 4.0 and Industrial Internet of Things (BTCOE802)	1	Understand the fundamental concepts of Industry 4.0, including sensing, actuation, communication, and networking.	3	2											2	
		2	Analyze the impact of Industry 4.0 on globalization, emerging issues, and smart and connected business perspectives.		1		1		3	-	3				3		
		3	Explore the technologies behind Industry 4.0, such as cyber-physical systems, next-generation sensors, augmented reality, artificial intelligence, and big data analytics.					2								2	2
		4	Evaluate the importance of cybersecurity in the context of Industry 4.0 and grasp the basics of industrial IoT, including industrial processes, sensing and actuation, and industrial internet systems.				3				3					2	
		5	Examine the business models and reference architectures of industrial IoT, focusing on IIoT business models, IIoT reference architecture, and IIoT layers including sensing, processing, communication, and networking.		3		3	2			3						
		6	Apply advanced concepts in Industrial IoT, including big data analytics, software-defined networks, security, fog computing, and explore various application domains		2	3		3	3		3		3	3	3		

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Open Elective - XII(B) BTCOE802 (B): Cryptography & Network Security	1	CO1: Understand the fundamentals of cryptography and its applications.	2	1	2			1		2	1	2	1	2		2
		2	CO2: Analyze classical cryptosystems and their vulnerabilities.	1	2	1	1	1	1	1	2	1	2	1	2		2
		3	CO3: Apply cryptanalysis techniques, including frequency analysis, to break substitution ciphers.		1	1	2		1		1	1	1		2	2	2
		4	CO4: Implement and analyze the Playfair cipher.	1	1	2	1	1	1	1	1	1	2	1	2	2	2
		5	CO5: Explore block ciphers and their modes of operation.	1	1	1	1	1	1	1	1	1	1	1	2	2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Open Elective - XII (C) BTCOE802 (C): Model Checking	1	CO1: Understand the principles and techniques of modeling code behavior and its application.	3	1												2
		2	CO2: Analyze and model hardware circuits using appropriate tools and methodologies.	2	3	2	3										2
		3	CO3: Apply modeling techniques to capture and analyze data-dependent programs.	2	2	3	1	2								2	2
		4	CO4: Model concurrent systems and analyze their behavior.	1				3								2	2
		5	CO5: Utilize model checking tools for verification and validation of system models.	1				3								2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2022-23	Project phase - II (In-house) $ /Internship and project in the Industry (BTCOE803)	1	Plan and manage a major project effectively, including setting goals, creating timelines, managing resources, and coordinating project activities.	1	1	2		1	1			3	3	3	2	3	
		2	Analyze and solve complex engineering problems in the context of the major project using appropriate analytical techniques, algorithms, and tools.	3	3		3	3			3				3	3	
		3	Design and develop innovative and practical solutions for software/hardware systems, considering factors such as performance, security, usability, and maintainability.	2	3	3	3	3							3	3	
		4	Work collaboratively in multidisciplinary project teams, communicate project requirements, progress, and outcomes effectively, and deliver presentations and documentation.				2		3		3	3	3	3		3	3
		5	Adhere to ethical guidelines and professional standards in conducting the major project, considering aspects such as privacy, security, intellectual property, and social impact.						3	3	3		3				3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2021-22

Doc No : BITACAD/CO-POMapping/COMP/Odd/2021-22

Session	ODD SEMESTER

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Engineering Mathematics – III (BTBS301)	1	Understand the concept of Laplace transform and inverse Laplace transform of elementary functions and apply it to solve the linear differential equations with constant coefficients having their applications in mechanical, electrical, chemical, communication etc. systems.	3	2									1	
		2	Apply the concept of Fourier transform to solve the boundary value problems, problems in signal processing and communication system.	2	2									2	
		3	Apply partial differential equations to solve heat equation, wave equation and Laplace equation etc.	3	2									1	
		4	Analyze conformal mapping, transformation and perform contour integration of complex function in the study of electromagnetics and signal processing.	3	2									2	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Discrete Mathematics (BTCOC302)	1	To understand the basic principles of sets and operations	3	3		1			3			2	1	
		2	To demonstrate an understanding of relations and functions and to determine their properties.	3	3	1				2				1	
		3	To model problems in Computer Science using graphs.		3					3				2	
		4	To model problems in Computer Science using trees.	3						3			2	2	
		5	To understand various algebraic structures and their properties.	3	3									2	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Data Structures (BTCOC303)	1	To understand the basic terminologies of Data Structures, arrays and Hashing	2			2							1	
		2	To understand and implement stacks, queues data structures and their applications	3	1		2							2	2
		3	To design and implement various types of linked lists and its various applications	2			1							2	2
		4	To implement concepts from trees and graphs to explore algorithms based on them.	3	2	2	3							2	2
		5	To understand, apply and evaluate various searching and sorting techniques.	2			2							2	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Computer Architecture & Organization (BTCOC304)	1	To understand the basic hardware and software issues of computer organization			3				3			3	1	
		2	Identify functional units,bus structure and addressing modes.			3				3			3	1	
		3	Students will be able to identify where,when and how enhancements of computer performance can be accompolished.				2			2			2		1
		4	Identify memory hierarchy and performance.			2	1								
		5	To understand control unit design and input/output organization and pipelining.							3			3		

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Elective –I (A) Object Oriented Programming in C++ (BTCOC 305)	1	Demonstrate the features of object oriented programming approach and basic constructs of C++.			3		1						3	2
		2	Implement modular programming using functions and its overloading.	1		3	3	1						3	2
		3	Formulate user define data type using classes and objects.	1		3	3	1						3	2
		4	Discuss various methods to initialize an object using constructors and destructors.			3	3							3	2
		5	Illustrate the concepts of friend functions and polymorphism using operator overloading. To choose and design reusable applications.			3	2							3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Elective –I (B) Object Oriented Programming in Java (BTCOC305)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects.			3								3	2
		2	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.			3								3	2
		3	Understand and build applications using Arrays.			3	2							3	2
		4	Design and build applications using Inheritance and Polymorphism.			3	3	1					2	3	2
		5	Make use of Exception-handling to build the robust applications and demonstrate the use of Java script for client-side scripting			3	3						2	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Data Structures Lab & Object Oriented Programming in Java(BTCOL306)	1	To understand the basic terminologies of Data Structures, arrays and Hashing	2			2							2	2
		2	To understand and implement stacks, queues data structures and their applications	3	1		2							2	2
		3	To design and implement various types of linked lists and its various applications	2			1							2	2
		4	To implement concepts from trees and graphs to explore algorithms based on them.	3	2	2	3							2	2
		5	To understand, apply and evaluate various searching and sorting techniques.	2			2							2	2
		1	Understand the principles of object-oriented concepts, create classes, instantiate objects.			3								3	2
		2	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.			3								3	2
		3	Understand and build applications using Arrays.			3	2							3	2
		4	Design and build applications using Inheritance and Polymorphism.			3	3	1					2	3	2
		5	Make use of Exception-handling to build the robust applications and demonstrate the use of Java script for client-side scripting			3	3						2	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Seminar-I (BTCOS307)	1	State the exact title of the seminar	2					2	2	2	2	1	1	3
		2	Explain the motivation for selecting the seminar topic and its scope								2		2	1	3
		3	Search pertinent literature and information on the topic	2					1	1	1	3	3	3	3
		4	Critically review the literature and information collected	2		1			2	1	2	2	2	2	3
		5	Demonstrate effective written and verbal communication		3	2	2	2			3				3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Field Training / Internship / Industrial Training Evaluation (BTES211P)	1	To provide industrial exposure to student to experience the real world problems through short industry projects				2						1	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations				2						1	3	3
		3	To identify gap in existing knowledge to help develop a specialization				2						1	3	3
		4	To create awareness about technical report writing among the student.				2				3		1	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Database Systems (BTCOC501)	1	Model, design databases for real life applications and depict a database system using E-R Diagram and learn data models.					3					3			3	
		2	To conceptualize and depict a database system Relational Algebra and Calculus		3	3										3	
		3	formulate SQL queries on the respect data and Understand validation framework using Normalization.			3		3					3			3	
		4	To understand Query processing.	3		3										3	
		5	To understand File Organization, Indexing & Hashing							3						3	
		6	To Understand transaction concepts and techniques.							3						3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Theory of Computations (BTCOC502)	1	Outline the concept of Finite Automata and Regular Expression	3	2	2											3
		2	Illustrate the design of Context Free Grammar for any language set	3	2												3
		3	Demonstrate the push down automaton model for the given language	3	2	2		1									3
		4	Make use of Turing machine concept to solve the simple problems	3	2	2											3
		5	Explain decidability or undecidability of various problems	3	2												3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Machine Learning (BTCOC503)	1	Understand the basic concepts and different models of learning.	1	1										1		
		2	Understand and apply probabilistic machine learning.			2	2	1								2	1
		3	Apply basic machine learning algorithms like regression and classification.		3	3	3								2	2	1
		4	Understand and apply artificial neural network to real world problems.			2	2	1								2	1
		5	Design hybrid machine learning model.		3		3	2							2	2	1
		6	Demonstrate unsupervised learning using clustering.		3		3	2							2	2	1

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – III (A) Introduction to Research (BTCOE504)	1	Develop understanding on various kinds of research, objectives of doing research, research process, research designs and its methodologies.	2			1				2					2	
		2	Identify appropriate research topics and define apt research problems with parameters in using quantitative and qualitative research.	3			1				2					2	
		3	Describe the inductive nature of qualitative data analysis and apply adequate knowledge on measurement & scaling techniques for modelling.	3		3	2					3				2	
		4	Demonstrate effective oral and written communication skills in the professional context during research conduction.	3			3					3				2	
		5	Demonstrate effective oral and written communication skills in the professional context with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research conduction.				3					3				2	
		6	Organize and conduct research (advanced project) in a more appropriate manner												3	2	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – III (B) Cyber Laws (BTCOE504)	1	Gain a comprehensive understanding of computers, the internet, and cyber laws, along with the conceptual framework of e-commerce and e-governance. Understand the role of electronic signatures in facilitating e-commerce within the context of a free market economy in India.		1		3		2		2				2		1
		2	Develop knowledge and understanding of the legal aspects surrounding electronic records and digital signatures. Learn about the rules and regulations governing certifying authorities in India and explore the protection of intellectual property rights in cyberspace within the Indian legal framework.		2		2		2						2		1
		3	Explore international efforts and initiatives concerning cyberspace laws. Gain familiarity with the Council of Europe (COE) Convention on Cyber Crimes and understand the global legal landscape of cyberspace laws.		2		2		2						2		1
		4	Acquire knowledge of the penalties, compensation, and adjudication procedures for violations of provisions under the IT Act. Learn about important offences under the cyberspace law and the internet in India, as well as other offences outlined in the Information Technology Act.			2			2		1				2		1
		5	Understand the role of electronic evidence in legal proceedings. Familiarize yourself with the miscellaneous provisions of the Information Technology Act, as amended up to 2008. Learn about the Information Technology (Certifying Authorities) Rules, 2000, and gain awareness of the Ministerial Order on Blocking of Websites.		3		3		2						2		1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – IV (A) Economics and Management (BTCOE505)	1	Analyze market equilibrium, elasticity of demand, and cost-volume-profit relationships					1								-	-
		2	Analyze financial statements for variance analysis and budgeting					2								-	-
		3	Compare alternative investment options					2								-	-
		4	Apply depreciation accounting methods					2								-	-
		5	Understand the process of product development													-	-
		6	Understand the basics of inventory management and supply chain management													-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – IV (B) Business Communication (BTCOE505)	1	Develop communication competence of the students.										3		2	-	-
		2	Understand international market and Inter-Cultural Communication.									2			2	-	-
		3	Analyze and overcome barriers of communication										3		2	-	-
		4	Understand and practice better interpersonal communication										2		2	-	-
		5	Develop leadership skills and team spirit.									3			2	-	-
		6	Apply negotiation skills and ethics in Business Communication.								2				2	-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Competitive Programming-I (BTCOC506)	1	Understand online judge platform and use it for program evaluation		1	1											1
		2	Apply Elementary Data Structures to solve programming problems	1	2	2										1	2
		3	Apply strings to solve programming problems		3	2	1	2								1	2
		4	Apply Sorting technics to solve programming problems		1	1	1									1	2
		5	Apply Arithmetic and Algebra to solve programming problems	1	1	1	2									1	2
		6	Apply Combinatorics Data Structures to solve programming problems	1	2	2	2									1	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Database Systems Lab (BTCOL507)	1	Model, design databases for real life applications and depict a database system using E-R Diagram						3			3	3			3	
		2	To conceptualize and depict a database system Relational Algebra and Calculus													3	
		3	Understand SQL and Understand validation framework using Normalization.						3			3	3			3	
		4	To understand Query processing.													3	
		5	To understand File Organization, Indexing & Hashing													3	
		6	To Understand transaction concepts and techniques.													3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Machine Learning Lab (BTCOL508)	1	Understand the basic concepts and different models of learning.	1	1										1		
		2	Understand and apply probabilistic machine learning.			2	2	1								2	1
		3	Apply basic machine learning algorithms like regression and classification.		3	3	3								2	2	1
		4	Understand and apply artificial neural network to real world problems.			2	2	1								2	1
		5	Design hybrid machine learning model.		3		3	2							2	2	1
		6	Demonstrate unsupervised learning using clustering.		3		3	2							2	2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Seminar (BTCOS509)	1	State the exact title of the seminar	2					2	2	2	2	1		1	3	2
		2	Explain the motivation for selecting the seminar topic and its scope								2		2		1	3	2
		3	Search pertinent literature and information on the topic			2			1	1	1	3	3		3	3	2
		4	Critically review the literature and information collected	1		3			2	1	2	2	2		2	3	2
		5	Demonstrate effective written and verbal communication										3		3	3	3
		6	Will be able to understand the Research aspects related to topic		3		3								3	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Internship /Industrial Training Evaluation (BTCOF411)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Software Engineering (BTCOC701)	1	To understand the software processes and various software process model's applicability along with the ethical practices to be followed .		2	3	2				2			2		3	1
		2	To be able to analyse software requirements using requirement engineering process and develop SRS document for a project.		2				2			2	2	2		3	1
		3	To be able to apply various system and architectural modelling techniques to a software project.			2	1	1								2	
		4	To gain knowledge of software design with object oriented design approach, design patterns and its methodology.	1	1	2										3	
		5	To distinguish between different testing strategies and its applicability in various software processes.			2	1	1								3	
		6	Recognize the importance of non functional aspects and its impact on software engineering.		1	2			1								

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective - VIII (A) Big Data Analytics (BTCOE702)	1	To understand and study the basic technologies that forms the foundations of Big Data.	1	2	2	2									1	
		2	To study the programming aspects with a view to big data applications.		2	2	2	1								1	1
		3	To understand and evaluate big data streaming ecosystem				2	1								1	1
		4	To understand the specialized aspects of big data including big data application, and big data analytics		2	2	2									1	1
		5	To understand, apply and create query processing on MongoDB	1			3	2								2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective - VIII (B) Distributed System (BTCOE702)	1	Define basic terminology of Distributed System.	3				2									3
		2	Appreciation of the fundamentals, advantages, and challenges in designing and implementing distributed systems.	3	2			1									3
		3	Appreciation of the differences in the handling of issues like mutual exclusion, deadlock detection, fault handling, etc. in a centralized system and a distributed system.	3	2			1									3
		4	Ability to write distributed programs using sockets, RPC/RMI, etc	3	2			1									3
		5	Ability to make intelligent choices from among available algorithms and techniques for the design of distributed systems subject to specific design and performance constraints.	3	2			1									3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective - VIII (C) Fundamental of Digital Image Processing (BTCOE702)	1	To understand the fundamentals of digital imaging and image transformation techniques.	1											2		
		2	Apply image enhancement techniques in both the spatial and frequency (Fourier) domains.				2	2								2	1
		3	Analyze the basic algorithms used for image compression & restoration.	1				2								2	1
		4	Apply image segmentation techniques to partition an image into its constituent parts or objects.	2		3		3								2	1
		5	Make use of techniques, skills, and modern engineering tools necessary for engineering application to real problems			2		2									

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective - IX(A) - Cloud Computing (BTCOE703)	1	To understand the different levels of virtualization in the cloud system and its application in scenario specification.	3				2			2						3
		2	To understand and apply cloud services in reference to cloud models.	3				2	1								3
		3	To understand the scaling methods and to apply proper measures by analyzing the scenario.	3			2	2									3
		4	To understand and use of Aneka as a public , private and hybrid cloud model.	3			2	2									3
		5	To understand the role of cloud serves from competitors and applications view.	3			2	3			3						3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective - IX (B) - Business Intelligence (BTCOE703)	1	Understanding the need for BI with Practical skills in Business Intelligence and Decision Support to utilize the most current software products in everyday decision making; Describe the concepts and components of Business Intelligence (BI).				1			1	1					3	
		2	Understanding the basics of BI techniques development to Understand and design the technological architecture that underpins BI systems.	2	2		1									3	
		3	Apply theoretical concepts of the course for data integration in order to prepare students for making appropriate managerial decisions in future real-life situations. Through applying the practices to understand how “text book theory” works “in today’s bus	1	1	1	2									3	
		4	Understand and use the technologies and tools that make up Data processing.	1	2		2	1								3	
		5	Design Data warehouse models using appropriate schemas to meet business objectives and Apply data analysis techniques for enterprise reporting.	1	1	3	1					1		2		3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective - IX (C) - Natural Language Processing (BTCOE703)	1	Students will be able to understand the fundamental concepts of Natural Language Processing	2	2	3	2										1
		2	Students will be able to design algorithms for NLP tasks		2	3										3	2
		3	Students will be able to develop useful systems for language processing and related tasks involving text processing		2	3										3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective - X (A) Blockchain Technology (BTCOE704)	1	Illustrate the essential concepts of blockchain technology		1	1	1									2	2
		2	Explain the functioning of bitcoin cryptocurrency and various consensus algorithms.	1	2	2	2	2								2	2
		3	Distinguish between different types of blockchain and evaluate different consensus models for permissioned blockchain		1	1	1									2	2
		4	Assess different types of uses of blockchain and analyze its implementation in real-life scenarios		2	2	2	2					1			3	2
		5	Develop smart contract/chaincode using Hyperledger Fabric and Ethereum	1	2	2	2	2								3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective - X (B) Computer Graphics (BTCOE704)	1	Understand the basics of computer graphics, different graphics systems, devices, and applications of computer graphics.	1		1										1	
		2	Discuss various 2D transformation algorithms and different clipping techniques.	1		2		2								1	
		3	Understand various 3D transformations and projections techniques.	1		2		2								1	1
		4	Design Graphicaal User Interface using various graphics designing tools		1	3		2							1		1
		5	Explore fundamentals of animation and discuss its types			3	1								1		1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective - X (C) Embedded Systems (BTCOE704)	1	Understand the fundamentals of embedded systems, including the design challenges, processor technology, and IC technology.	3	1	1	1	2	-	-	2	1	-	-	-	2	1
		2	Analyze and design custom single-purpose processors, including hardware-combinational logic, sequential logic, and RT-level design.	1	2	-	-	-	-	-	2	1	-	-	-	2	2
		3	Gain knowledge of system control in embedded systems, including pin and register description, memory mapping control, and power control.	1	1	2	1	1	-	-	1	-	-	-	-	1	1
		4	Explore the functionality and operation of communication interfaces such as UART, SPI, and I2C in embedded systems.	-	-	-	2	1	-	-	-	-	-	-	-	3	2
		5	Develop an understanding of process scheduling in embedded systems, including real-time operating systems (RTOS) and system design using simulation software.	2	-	-	1	2	-	-	2	1	-	-	-	2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective - X (D) Design Thinking (BTCOE704)	1	Gain a comprehensive understanding of the design thinking process, its models, phases, and its correlation with other philosophies. Develop knowledge of design thinking tools and their application in problem-solving, emphasizing the importance of design thinking in the business context of innovation.			2		1			1		2		1	2	
		2	Learn the role of empathy in design thinking and develop skills in empathizing with users. Acquire techniques for creating empathy maps, user personas, and customer journey mapping. Formulate effective "How might we" questions to drive the design thinking process.			1		1				1	2			1	1
		3	Develop analytical skills for root cause analysis, conflict of interest analysis, and perspective analysis in the context of design thinking. Explore big picture thinking through system operator and function modeling. Apply brainstorming techniques, metaphors, and ideation tools such as CREATE and What-If. Introduce the principles and applications of TRIZ for inventive problem-solving.		1	2	1	2			1	1			2	1	2
		4	Acquire practical skills in prototyping and validation within the design thinking process. Understand the assumptions involved and learn best practices for presenting and testing prototypes in the market.			1	2	2				1	1			1	2
		5	Understand the benefits of iteration in the design thinking process and its role in fostering design innovation. Learn how to effectively take ideas to the market and gain an introduction to innovation management within a company.				1					1	1			2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Full stack Development Lab (BTCOL705)	1	Implement the Web development features like finding Geolocation, saving Session information, Adding audio and video etc.	1	2	2										2	
		2	Implement the basic web elements and its design using HTML5, CSS and advance CSS properties.	1	2	2										2	
		3	Understand the concepts of programming and problem solving through HTML & JavaScript.		1	1										2	1
		4	Understanding the basic concepts of PHP and its applications.		2	2		1								2	1
		5	To design and develop dynamic, database-driven web applications using PHP.	2	3	3	2	2								2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	System Administration Lab (BTCOL706)	1	To install & configure various linux flavours (8hr)	2				2								1	
		2	To install SSH and telnet server on ubuntu					2					1			1	
		3	To install FTP server on ubuntu & perform Uploading/Downloading	3				3					2			1	
		4	To install & configure http and proxy server on ubuntu	2				2								1	
		5	To install & configure samba server on ubuntu	2				2								1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective VIII Lab: Big Data Analytics Laboratory (A) (BTCOL707)	1	Understanding of Big Data and its technologies.	1	2	2										1	1
		2	Ability to understand, apply, analyze and create Programs on Big Data Platforms		2	2	2									1	2
		3	Ability to understand, apply and analyze Big Data Applications		2	2	2									1	2
		4	Ability to understand, apply and analyze Database for the Modern Web	1		2	3	2								1	2
VII	Elective VIII Lab: Big Data Analytics Laboratory (A) (BTCOL707)			1.00	2.00	2.00	2.33	2.00	-	-	-	-	-	-	-	1.00	1.75

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective VIII Lab: Distributed System Lab (B) (BTCOL707)	1	Apply the concepts of Remote Procedure Call (RPC) and Remote Method Invocation (RMI).	3												2	2
		2	Design and implement distributed applications using message passing interfaces, synchronization algorithms, and multi-threaded client/server processes.	3		3		1								2	2
		3	Configure and test server socket options, such as SO_KEEPALIVE, SO_LINGER, SO_SNDBUF, SO_RCVBUF, and TCP_NODELAY.	3		2		1								2	2
		4	Implement shared memory operations, including incrementing a counter, and study the implementation of Election and Mutual Exclusion algorithms.	3		3		1								2	2
		5	Develop Network File System (NFS) and demonstrate its functionality.	3		3		1								2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective VIII Lab: Fundamental of Digital Image Processing (C) (BTCOL707)	1	To understand the fundamentals of digital imaging and image transformation techniques.	1											2		
		2	Apply image enhancement techniques in both the spatial and frequency (Fourier) domains.				2	2								2	1
		3	Analyze the basic algorithms used for image compression & restoration.	1				2								2	1
		4	Apply image segmentation techniques to partition an image into its constituent parts or objects.	2		3		3								2	1
		5	Make use of techniques, skills, and modern engineering tools necessary for engineering application to real problems			2		2									

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective IX Lab: Cloud Computing Laboratory (A) (BTCOL708)	1	To understand the different levels of virtualization in the cloud system and its application in scenario specification.	3				2			2						3
		2	To understand and apply cloud services in reference to cloud models.	3				2	1								3
		3	To understand the scaling methods and to apply proper measures by analyzing the scenario.	3			2	2									3
		4	To understand and use of Aneka as a public , private and hybrid cloud model.	3			2	2									3
		5	To understand the role of cloud serves from competitors and applications view.	3			2	3			3						3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective IX Lab: Business Intelligence Laboratory (B) (BTCOL708)	1	Understanding the need for BI with Practical skills in Business Intelligence and Decision Support to utilize the most current software products in everyday decision making; Describe the concepts and components of Business Intelligence (BI).				1			1	1					3	
		2	Understanding the BI techniques development to Understand and design the technological architecture that underpins BI systems.	2	2		1									3	
		3	Apply theoretical concepts of the course to the decision-making and BI processes and technologies in order to prepare students for making appropriate managerial decisions in future real-life situations. Through applying the practices to understand how “text book theory” works “in today’s business practices”.	1	1	1	2									3	
		4	Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of Online analytical processing (OLAP)).	1	2		2	1								3	
		5	Design Data warehouse models using appropriate schemas to meet business objectives and Apply data analysis techniques for building Decision Support System.	1	1	3	1					1		2		3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective IX Lab: Natural Language Processing (C) (BTCOL708)	1	Students will be able to understand the fundamental concepts of Natural Language Processing	2	2	3	2										1
		2	Students will be able to design algorithms for NLP tasks		2	3										3	2
		3	Students will be able to develop useful systems for language processing and related tasks involving text processing		2	3										3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Project Phase-I (BTCOP709)	1	Plan and manage a major project effectively, including setting goals, creating timelines, managing resources, and coordinating project activities.	1	1	2		1	1			3	3	3		3	
		2	Analyze and solve complex engineering problems in the context of the major project using appropriate analytical techniques, algorithms, and tools.	3	3		3	3			3				3	3	
		3	Design and develop innovative and practical solutions for software/hardware systems, considering factors such as performance, security, usability, and maintainability.	2	3	3	3	3							3	3	
		4	Work collaboratively in multidisciplinary project teams, communicate project requirements, progress, and outcomes effectively, and deliver presentations and documentation.				2		3	-	3	3	3	3		3	3
		5	Adhere to ethical guidelines and professional standards in conducting the major project, considering aspects such as privacy, security, intellectual property, and social impact.						3	3	3		3				3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Field Training / Internship / Industrial Training (BTCOF609)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2021-22 **Doc No : BITACAD/CO-POMapping/COMP/Even/2021-22**

Session	**Even SEMESTER**

	Course/Subject with course code		**Course Outcomes (COs)**	**Program Outcomes (POs)**										**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**
2021-22	Design & Analysis of Algorithms (BTCOC401)	**1**	Analyzing the time complexity of a given algorithm and data structure operations.	3			2							1	
		2	Analyze and Design algorithms using divide and conquer approach.	3	2		2							2	2
		3	Analyze and Design algorithms using backtracking and branch and bound techniques.	2			2							2	2
		4	Analyze and Design algorithms using a greedy approach.	2	2	2	2							2	2
		5	Analyze and Design algorithms using dynamic programming and distinguish between P and NP classes of problems.	2			2							2	2

	Course/Subject with course code		**Course Outcomes (COs)**	**Program Outcomes (POs)**										**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**
2021-22	Operating Systems (BTCOC402)	**1**	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation	3	2	2	2						3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system	2	2	3	3			3				2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system	3	3	2	2							2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system	3	2	2	2							2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts	3	3	3	3							1	
		6	Explain concept of File systems used in operating system, classify the access methods and disk arm scheduling strategies	3	3	3	3	3						1	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Basic Human Rights (BTHM403)	1	Understand the history of human rights.								2	3		-	-
		2	Learn to respect others caste, religion, region and culture.								2	3		-	-
		3	Be aware of their rights as Indian citizen.								1	3		-	-
		4	Understand the importance of groups and communities in the society.								1	2		-	-
		5	Realize the philosophical and cultural basis and historical perspectives of human rights.								1	3		-	-
		6	Make them aware of their responsibilities towards the nation.								1	3		-	-

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Probability Theory and Random Processes (BTBS404)	1	apply Baye's theorem, basic probability axioms and rules to solve the problems, also they apply problem-solving techniques to solving real-world events.	1	3		2							2	
		2	calculate probabilities; derive the marginal and conditional distributions of bivariate random variables.	1	3		2							2	
		3	apply selected probability distributions (binomial, Poisson and normal) to solve problems.	1	3		2							1	
		4	calculate the correlation between two variables and simple linear regression equation for the set of data, also they apply the principles of linear regression and correlation (including least square method) and predict the particular value of Y for given value of X and significance the correlation coefficient.		2									2	
		5	perform the test of significance and calculate difference of proportions, single mean, difference of means, and difference of standard deviations.		3									1	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Digital Logic Design & Microprocessors (BTES405)	1	Understand the fundamental concepts and structure of various number systems and its applications along with concepts of digital electronics.	3										2	1
		2	Ability to understand, analyse and design various combinational circuits	3										3	2
		3	Ability to understand, analyse and design various sequential circuits	3										3	2
		4	Understand the internal architecture of microprocessors along with fundamental concepts of 8,16 and 32 bit microprocessors.		2				1					2	1
		5	Understand the concepts of memory and its interfacing with microprocessors.	3		1			1					2	1
		6	Apply knowledge and demonstrate programming proficiency using various logical, arithmetic and data transfer instructions of the target microprocessor.			2			2				1	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Operating System Lab & Python Programming Lab (BTCOL406)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system							3			3	2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system				2						3	2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3	1	
		6	Explain concept of File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3	1	
		1	Understand the concepts of programming and problem solving through python programming	3	3	2	3	3					2	3	3
		2	Implement the basic constructs of programming language like variables, loops, assignments, strings etc.	3	3	2	2	3					2	3	1
		3	Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.	3	2	2	3	3					2	3	1
		4	Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.	3	3	3	2	3					2	3	1
		5	Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems.	2	1	2	1	3					2	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)										PSOs	
				1	2	3	4	5	6	7	8	9	10	1	2
2021-22	Seminar – II (BTCOS407)	1	Design HTML pages using HTML tags					3	3		2			2	
		2	Design HTML pages using CSS.					3	3		2			2	
		3	Implement the concept of javascript for designing interactive web pages.			2		3	3					2	1
		4	Implement PHP as a server side scripting language.			2	1	3	3	1	1		1	2	1
		5	Use jQuery and AJAX to create dynamic interactive websites that communicate with a backend server.			2	1	3	3	1			1	2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Compiler Design (BTCOC601)	1	Discuss the major phases of compilers and use the knowledge of the Lex tool	3	3			1									3
		2	To understand and apply the logic of assembling a NFA from regular expression.	3	3												3
		3	To understand and differentaite the logics behind top down paring and bottum up parsing	3	3	2	2										3
		4	Describe intermediate code representations using syntax trees and DAG's.	3	3	2	1										3
		5	Understand the use of procedural calls in intermediate code generation.	3	3	1	2										3
		6	Summarize various optimization techniques used for dataflow analysis and generate machine code from the source code of a novel language.	3	3	2	2										3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Computer Networks (BTCOC602)	1	Develop an understanding of modern network architectures , study protocols, network standards, the OSI model,TCP/IP model.				3									2	2
		2	Study different LAN,WI-FI and Wireless technologies.				3									2	2
		3	Study different error correcting and detecting codes.	3												2	3
		4	Study IP addressing scheme , routing algorithms ,ability to write program using socket programming.				3									2	3
		5	Study different application protocols.					3								2	2
		6	Ability to understand basic concepts of network security using cryptographic techniques.								3					2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – V (A) Human Computer Interaction (BTCOE603A)	1	[HCCO1] Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.	1												3	
		2	[HCCO2] Describe the key design principles for user interfaces.			2		3	3							3	
		3	[HCCO3] Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems.			3	2		2							2	
		4	[HCCO4] Develop and implement a process to gather requirements for, engage in iterative design of, and evaluate the usability of a user interface.				3	2	2							2	
		5	[HCCO5] Demonstrate and knowledge of human computer interaction design concepts and related methodologies. with effective work design to real-world application.									2	2			2	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – V (B) Artificial Intelligence (BTCOE603)	1	Understand the notions of rational behavior and intelligent agents.			1										2	1
		2	Analyze and formalize the given problem as a state space search, design heuristics and select amongst different search or game based techniques to solve them.			3	3				3				1	2	1
		3	Develop intelligent algorithms for constraint satisfaction problems.			2	2									2	1
		4	Design intelligent systems for game playing in a competitive environment.			2	2									2	
		5	Attain the capability to represent various real life problem domains using logic based techniques and use this to perform reasoning and planning.	2							2					1	1
		6	Formulate and solve problems with uncertain information using Bayesian approaches.	2							2					1	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – V (C) Object-Oriented Analysis Design (BTCOE603C)	1	To understand basic object oriented programming concepts like objects, classes, encapsulation,polymorphism and abstraction.	1										1		2	
		2	To understand various types of structural and behavioral diagrams and to draw them for real life applications.		3	2		2					2			1	
		3	To analyze problems using use cases and CRC card analysis methods.		2	1											
		4	To understand and distinguish various design patterns.		2		2									1	
		5	To implement various object oriented analysis and design concepts.		2	1								3		1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – VI (A) Geographic Information System (BTCOE604A)	1	Understand basic concepts associated with GIS	1												2	2
		2	Understand apply and differentiate vector, raster and TIN		2											2	2
		3	Understand Digital Elevation Model (DEM), its resolutions and apply preprocessing techniques.		2	2										2	2
		4	Analyze Digital Elevation Model (DEM) and enhance its quality		2		2	2		1			2			1	2
		5	Application of GIS tools for identification of errors.	1	2		3	3		2			2			3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – VI (B) Biology (BTCOE604B)	1	Outline the biological process, principles and applications				1										
		2	Classify the theories of origin of life, based on their types, structure and characteristics		1	1				1							
		3	Expand the information of living systems evolution and to consider the systems in relationship to the self and ecosystem function				1			1							
		4	Demonstrate the ability to describe and discuss the methods used to demonstrate the functions of the cell systems in the body						1	1							
		5	Know the basics of recombination in Prokaryotes cells						1	1							
		6	Interpret various aspects of Biological System, its principles and applications														

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective – VI (C) Internet of Things (BTCOE604C)	1	Understand and describe basics of IoT and able to identify the components that forms a part of Architecture.	2												-	-
		2	Understand the concept of sensors and actuators in terms of “Things” in IoT and role of Communication Technologies.	2			3									2	1
		3	Understand and evaluate appropriate communication protocol for IoT systems.	1			3									2	3
		4	Understand and appreciate the roll of Machine Learning, Big Data, and Data Analytics in IoT systems.	3	2	2	2	2								3	2
		5	Apply the knowledge and skill acquired to build and test a complete working IoT system involving prototype programming	3	2	2		3								3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective – VII (A) Development Engineering (BTCOE605)	1	Demonstrate understanding of the principles of Development Engineering						1							1	2
		2	Understand the state of poverty in India via various human development indexes and understand the role of the engineer in sustainable development and engineering ethics.	1			2		2							1	2
		3	Analyze the social justice system for the parameters of human dignity, equal rights and social inclusion, along with environmental justice and be able to explain how social philosophies impact the appropriateness and sustainability of engineering solutions.	1			2			1						2	2
		4	Learn about implementation of development strategies via perspectives of social, technological, economic, health, education and business.			2		2		2		2				2	1
		5	Apply engineering knowledge and skills to a real-world humanitarian problem via participatory development through a technical design project, considering complex social factors and the unique needs of stakeholders and present the result in both verbal and written forms.	2		2	3			3			2			3	2
		6	Implement Modern tools of information technology, Machine Learning and block chain for Social Development.					1								3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective – VII (B) National Social Service (BTCOE605)	1	Understand the history, philosophy, aims & objectives of NSS, organizational structure, regular activities, special camping, and survey methodology.								3						
		2	Define youth, explore their profiles, categories, and their role as agents of social change; emphasize youth-adult partnership, community mobilization, and the importance of volunteerism.						2		3	3	1			1	
		3	Recognize the meaning and types of leadership, the qualities and traits of good leaders, and the significance of youth leadership.						2		2	2	1			1	
		4	Develop life competencies including communication, problem-solving, positive thinking, self-confidence, goal setting, stress, and time management.		2	3	2		2		3	1	3				
		5	Explore social harmony, national integration, and the role of youth in peace-building, conflict resolution, and nation-building.						2		3	3	2			1	
		6	Understand the National Youth Policy, youth development programs at national, state, and voluntary levels, and youth-focused/led organizations in India.								2	2					

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective – VII (C) Consumer Behaviour (BTCOE605)	1	Understand the scope, application ,importance and evolution of consumer behaviour														
		2	LEarn Market segmentation and understand the consumer decisionmaking process that leads to buying		1		1										
		3	Learn about models of consumer behavior		1		1										
		4	Be aware about the psychological and sociological influences on consumer decision making														
		5	Learn consumer behavior and maketing strategy		1		1										
		6	Understand multiplicative innovation model and Seth model of industrial buying				1										

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Competitive Programming-II (BTCOC606)	1	ApplyNumber theory Structures to solve programming problems		1	1											1
		2	Apply Backtracking to solve programming problems	1	2	2										1	2
		3	Apply Graph Traversals to solve programming problems		3	2	1	2								1	2
		4	Apply Graph Algorithms to solve programming problems		1	1	1									1	2
		5	Apply Dynamic Programming to solve programming problems	1	1	1	2									1	2
		6	Apply Grids to solve programming problems	1	2	2	2									1	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	(A) Mobile Application Development (BTCOL607)	1	Develop a solid foundation in Swift programming, including data types, operators, control flow, and basic app development concepts.	1											2	2	
		2	Gain proficiency in UI Kit and its components, such as views, controls, and Auto Layout, to create responsive user interfaces for iOS apps.			2		3									2
		3	Acquire skills in navigating and structuring app workflows using navigation controllers, tab bar controllers, and segues, while effectively handling optionals and enumerations in Swift.		2	2											
		4	Implement data persistence techniques, image handling, and data sharing functionalities in iOS apps, utilizing scroll views, table views, and the user's photo library.				2										
		5	Apply advanced concepts like animations, concurrency, and web service integration to develop interactive and dynamic iOS apps, culminating in the successful completion of a self-designed app project.														

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	(A) Internet of Things Laboratory (BTCOL607)	1	Develop server applications & corresponding client application for Arduino/Raspberry Pi by interfacing of various sensors having ability to upload/download sensor data transmitted wirelessly between different devices	2	3	3	2	2	2						2	3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Computer Networks Lab (BTCOL608)	1	Develop an understanding of modern network architectures , study protocols, network standards, the OSI model,TCP/IP model.				3	3								2	3
		2	Study different LAN,WI-FI and Wireless technologies.				3	3								2	3
		3	Study different error correcting and detecting codes.	3				3								2	3
		4	Study IP addressing scheme , routing algorithms ,ability to write program using socket programming.					3								2	3
		5	Study different application protocols.					3								2	3
		6	Ability to understand basic concepts of network security using cryptographic techniques.					3			3					2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective XI(A): Deep Learning (BTCOE801)	1	Understand the fundamental concepts and principles of machine learning, including feature descriptors, Bayesian learning, and discriminant functions.	3	2	-	-	-	-	-	-	-	-	-	-	2	-
		2	Apply linear classifiers, support vector machines, and optimization techniques in machine learning to solve classification problems.	2	3	3	3	-	-	-	-	-	-	-	-	2	-
		3	Comprehend the basics of neural networks, including multilayer perceptrons, backpropagation learning, and loss functions.	2	3	3	3	2	-	-	-	-	-	-	-	2	-
		4	Explore the capabilities and applications of autoencoders, including their comparison with principal component analysis (PCA) and different variants of autoencoders.	2	3	3	3	2	-	-	-	-	-	-	-	2	-
		5	Gain knowledge of convolutional neural networks (CNNs) and their architectures, including popular models like LeNet, AlexNet, VGG16, and GoogleNet.	2	3	3	3	2	-	-	-	-	-	-	-	3	2
		6	Familiarize oneself with advanced topics in deep learning, such as optimization algorithms, normalization techniques and various applications	2	3	3	3	2	-	-	-	-	-	-	-	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective XI(B): Social Networks (BTCOE801)	1	Understand network analysis fundamentals and apply basic techniques using Python and Networkx.	3	3	1											3
		2	Apply the network concepts such as homophily and structural balance of the network using Networkx.	3			3	3								3	
		3	Explore social network structures, dynamics, and simulate social phenomena using relevant models.	3			3									3	
		4	Apply advanced techniques in network community detection and interpret communities using Gephi.	3	3	3	3									3	
		5	Investigate balanced networks, relationship dynamics, and implement algorithms for network transformation.	3		3	3									3	
		6	Understand PageRank and diffusion in networks, analyze their impact, and model information spread.	3	3	1	3	3								3	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Elective - XI (C) BTCOE801 (C): Randomized Algorithms	1	CO1: Understand randomized algorithms and their applications.	2	2	1	1	1			1	1	2		3	3	3
		2	CO2: Apply probability concepts to analyze randomized algorithms.	3	3	1	2	1			1	1	3		3	2	3
		3	CO3: Explore advanced topics in randomized algorithms.	2	2	2	2	1			1	1	2		3	3	3
		4	CO4: Analyze and design efficient algorithms for permutation routing.	2	2	3	3	2	1	1	2	2	2	1	3	3	3
		5	CO5: Gain knowledge of computational complexity concepts.	1	1			1					1		2	2	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective XII (A): Introduction to Industry 4.0 and Industrial Internet of Things (BTCOE802)	1	Understand the fundamental concepts of Industry 4.0, including sensing, actuation, communication, and networking.	3	2											2	
		2	Analyze the impact of Industry 4.0 on globalization, emerging issues, and smart and connected business perspectives.		1		1		3	-	3				3		
		3	Explore the technologies behind Industry 4.0, such as cyber-physical systems, next-generation sensors, augmented reality, artificial intelligence, and big data analytics.					2								2	2
		4	Evaluate the importance of cybersecurity in the context of Industry 4.0 and grasp the basics of industrial IoT, including industrial processes, sensing and actuation, and industrial internet systems.				3				3					2	
		5	Examine the business models and reference architectures of industrial IoT, focusing on IIoT business models, IIoT reference architecture, and IIoT layers including sensing, processing, communication, and networking.		3		3	2			3						
		6	Apply advanced concepts in Industrial IoT, including big data analytics, software-defined networks, security, fog computing, and explore various application domains		2	3		3	3		3		3	3	3		

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective - XII(B) BTCOE802 (B): Cryptography & Network Security	1	CO1: Understand the fundamentals of cryptography and its applications.	2	1	2			1		2	1	2	1	2		2
		2	CO2: Analyze classical cryptosystems and their vulnerabilities.	1	2	1	1	1	1	1	2	1	2	1	2		2
		3	CO3: Apply cryptanalysis techniques, including frequency analysis, to break substitution ciphers.		1	1	2		1		1	1	1		2	2	2
		4	CO4: Implement and analyze the Playfair cipher.	1	1	2	1	1	1	1	1	1	2	1	2	2	2
		5	CO5: Explore block ciphers and their modes of operation.	1	1	1	1	1	1	1	1	1	1	1	2	2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Open Elective - XII (C) BTCOE802 (C): Model Checking	1	CO1: Understand the principles and techniques of modeling code behavior and its application.	3	1												2
		2	CO2: Analyze and model hardware circuits using appropriate tools and methodologies.	2	3	2	3										2
		3	CO3: Apply modeling techniques to capture and analyze data-dependent programs.	2	2	3	1	2								2	2
		4	CO4: Model concurrent systems and analyze their behavior.	1				3								2	2
		5	CO5: Utilize model checking tools for verification and validation of system models.	1				3								2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2021-22	Project phase - II (In-house) $ /Internship and project in the Industry (BTCOE803)	1	Plan and manage a major project effectively, including setting goals, creating timelines, managing resources, and coordinating project activities.	1	1	2		1	1			3	3	3	2	3	
		2	Analyze and solve complex engineering problems in the context of the major project using appropriate analytical techniques, algorithms, and tools.	3	3		3	3			3				3	3	
		3	Design and develop innovative and practical solutions for software/hardware systems, considering factors such as performance, security, usability, and maintainability.	2	3	3	3	3							3	3	
		4	Work collaboratively in multidisciplinary project teams, communicate project requirements, progress, and outcomes effectively, and deliver presentations and documentation.				2		3		3	3	3	3		3	3
		5	Adhere to ethical guidelines and professional standards in conducting the major project, considering aspects such as privacy, security, intellectual property, and social impact.						3	3	3		3				3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2020-21

Doc No : BITACAD/CO-POMapping/COMP/Odd/2020-21

Session	**ODD SEMESTER**

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2020-21	Engineering Mathematics – III (BTBSC301)	**1**	Understand the concept of Laplace transform and inverse Laplace transform of elementary functions and apply it to solve the linear differential equations with constant coefficients having their applications in mechanical, electrical, chemical, communication etc. systems.	3	2											1	
		2	Apply the concept of Fourier transform to solve the boundary value problems, problems in signal processing and communication system.	2	2											2	
		3	Apply partial differential equations to solve heat equation, wave equation and Laplace equation etc.	3	2											1	
		4	Analyze conformal mapping, transformation and perform contour integration of complex function in the study of electromagnetics and signal processing.	3	2											2	

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2020-21	Discrete Mathematics (BTCOC302)	**1**	To understand the basic principles of sets and operations.	3											1	1	
		2	To demonstrate an understanding of relations and functions and to determine their properties.	3											1	1	
		3	To understand different methods in combinatorics.	2			2								1	2	
		4	To model problems in Computer Science using graphs.	2	2										1	2	
		5	To model problems in Computer Science using trees.	2	2										1	2	
		6	To understand various algebraic structures and their properties.	2											1	2	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Data Structures (BTCOC303)	1	To understand the basic terminologies of Data Structures	1	1												1
		2	To understand and apply Concept of sequential organization and hashing	2	3	3	2										2
		3	To understand, apply and evaluate various searching and sorting techniques.		2	2	1										2
		4	To design and implement various types of linked lists and its various applications		2	1											2
		5	To understand and implement stacks, queues data structures and their applications	2	3	3	2										2
		6	To implement concepts from trees and graphs to explore algorithms based on them.	2	3	3	2										2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Computer Architecture & Organization (BTCOC304)	1	To understand the basic hardware and software issues of computer organization			3										1	2
		2	Identify functional units,bus structure and addressing modes.		3										3	1	2
		3	Students will be able to identify where,when and how enhancements of computer performance can be accompolished.	3					3						3	1	2
		4	Identify memory hierarchy and performance.					3							3	1	2
		5	To understand control unit design.		3	3									3	1	2
		6	To understand input/output organization and pipelining			3									3	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Digital Electronics & Microprocessors (BTCOC305)	1	Understand digital signals, circuits, Boolean algebra, IC gates, binary arithmetic, and error detection codes.	2	3	3										2	
		2	Design logic functions using standard representation, K-maps, and implement multiplexers, decoders, adders, subtractors, and ALU.	2	3	3										2	
		3	Analyze and design sequential circuits, including flip-flops, shift registers, counters, and sequence generators.	2	3	3	2									2	3
		4	Comprehend microprocessor fundamentals, compare architectures (8085, 8086, 80386), and explain memory structures and timing diagrams.		3	3										2	
		5	Explain memory and I/O interfacing, DMA, and interrupts in 8086.		3	3										2	
		6	Utilize 8086 instruction set, addressing modes, and programming techniques to develop assembly and C language programs with programming tools.		3	3	3									2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Basic Human Rights (BTHM3401)	1	Understand the history of human rights.								2	1	1		2	-	-
		2	Learn to respect others caste, religion, region and culture.								2	1	2		2	-	-
		3	Be aware of their rights as Indian citizen.								2	1	1		2	-	-
		4	Understand the importance of groups and communities in the society.								2	3	3		2	-	-
		5	Realize the philosophical and cultural basis and historical perspectives of human rights.								2				2	-	-
		6	Make them aware of their responsibilities towards the nation.								2	1	2		2	-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Python Programming (BTCOL306)	1	Understand the concepts of programming and problem solving through python programming	3	3	2	3	3					2			3	3
		2	Implement the basic constructs of programming language like variables, loops, assignments, strings etc.	3	3	2	2	3					2			3	1
		3	Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.	3	2	2	3	3					2			3	1
		4	Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.	3	3	3	2	3					2			3	1
		5	Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems.	2	1	2	1	3					2			3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	HTML and JavaScript (BTCOL307)	1	To learn the concepts of web development process and project management by using various web technologies.	2		3						2		2		2	
		2	To learn evolution of markup languages and create hyperlinks,webforms,tables,frames,GUI in HTML.	2		2										2	
		3	To make use of web development tools for faster implementation of web projects.	2		2		2								1	
		4	Create tables, including strategies for inserting and styling tables, importing data into tables, and sorting data within tables in CSS.	2		2										1	
		5	Develop efficiency with basic javascript operators and number methods, including arithmetic operators, comparison operators,functions and trouble shooting.	2		2		3								1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Data Structures Lab (BTCOL308)	1	To understand the basic terminologies of Data Structures	1	1												1
		2	To understand and apply Concept of sequential organization and hashing	2	3	2	2										2
		3	To understand, apply and evaluate various searching and sorting techniques.		2	1	1										2
		4	To design and implement various types of linked lists and its various applications		1	1											2
		5	To understand and implement stacks, queues data structures and their applications	2	3	2	2										2
		6	To implement concepts from trees and graphs to explore algorithms based on them.	2	3	2	2										2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Digital Electronics & Microprocessor Lab (BTCOL309)	1	Apply digital logic principles to design and implement Boolean expressions, arithmetic circuits, and code converters.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		2	Construct and analyze various types of adders, subtractors, and comparators using logic gates.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		3	Implement led display drivers using decoder chips and understand the use of priority encoders.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		4	Verify the truth tables of various flip-flops and implement sequential circuits, including counters and sequence generators.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		5	Design and implement finite state machines (FSM) in both Moore and Mealy machine configurations.	2	2	3	1	-	-	-	-	-	-	-	-	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Field Training / Internship /Industrial Training Evaluation (BTES211P)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Database Systems (BTCOC501)	1	Model, design databases for real life applications and depict a database system using E-R Diagram and learn data models.					3					3			3	
		2	To conceptualize and depict a database system Relational Algebra and Calculus		3	3										3	
		3	formulate SQL queries on the respect data and Understand validation framework using Normalization.			3		3					3			3	
		4	To understand Query processing.	3		3										3	
		5	To understand File Organization, Indexing & Hashing							3						3	
		6	To Understand transaction concepts and techniques.							3						3	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Theory of Computations (BTCOC502)	1	Outline the concept of Finite Automata and Regular Expression	3	2	2											3
		2	Illustrate the design of Context Free Grammar for any language set	3	2												3
		3	Demonstrate the push down automaton model for the given language	3	2	2		1									3
		4	Make use of Turing machine concept to solve the simple problems	3	2	2											3
		5	Explain decidability or undecidability of various problems	3	2												3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Machine Learning (BTCOC503)	1	Understand the basic concepts and different models of learning.	1	1										1		
		2	Understand and apply probabilistic machine learning.			2	2	1								2	1
		3	Apply basic machine learning algorithms like regression and classification.		3	3	3								2	2	1
		4	Understand and apply artificial neural network to real world problems.			2	2	1								2	1
		5	Design hybrid machine learning model.		3		3	2							2	2	1
		6	Demonstrate unsupervised learning using clustering.		3		3	2							2	2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – III (A) Introduction to Research (BTCOE504)	1	Develop understanding on various kinds of research, objectives of doing research, research process, research designs and its methodologies.	2			1				2					2	
		2	Identify appropriate research topics and define apt research problems with parameters in using quantitative and qualitative research.	3			1				2					3	
		3	Describe the inductive nature of qualitative data analysis and apply adequate knowledge on measurement & scaling techniques for modelling.	3		3	2					3				3	
		4	Demonstrate effective oral and written communication skills in the professional context during research conduction.	3			3					3				3	
		5	Demonstrate effective oral and written communication skills in the professional context with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research conduction.				3					3				3	
		6	Organize and conduct research (advanced project) in a more appropriate manner	3			3					3				3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – III (B) Cyber Laws (BTCOE504)	1	Gain a comprehensive understanding of computers, the internet, and cyber laws, along with the conceptual framework of e-commerce and e-governance. Understand the role of electronic signatures in facilitating e-commerce within the context of a free market economy in India.		1		3		2		2				2		1
		2	Develop knowledge and understanding of the legal aspects surrounding electronic records and digital signatures. Learn about the rules and regulations governing certifying authorities in India and explore the protection of intellectual property rights in cyberspace within the Indian legal framework.		2		2		2						2		1
		3	Explore international efforts and initiatives concerning cyberspace laws. Gain familiarity with the Council of Europe (COE) Convention on Cyber Crimes and understand the global legal landscape of cyberspace laws.		2		2		2						2		1
		4	Acquire knowledge of the penalties, compensation, and adjudication procedures for violations of provisions under the IT Act. Learn about important offences under the cyberspace law and the internet in India, as well as other offences outlined in the Information Technology Act.			2			2		1				2		1
		5	Understand the role of electronic evidence in legal proceedings. Familiarize yourself with the miscellaneous provisions of the Information Technology Act, as amended up to 2008. Learn about the Information Technology (Certifying Authorities) Rules, 2000, and gain awareness of the Ministerial Order on Blocking of Websites.		3		3		2						2		1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – IV (A) Economics and Management (BTCOE505)	1	Analyze market equilibrium, elasticity of demand, and cost-volume-profit relationships					1								-	-
		2	Analyze financial statements for variance analysis and budgeting					2								-	-
		3	Compare alternative investment options					2								-	-
		4	Apply depreciation accounting methods					2								-	-
		5	Understand the process of product development													-	-
		6	Understand the basics of inventory management and supply chain management													-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – IV (B) Business Communication (BTCOE505)	1	Develop communication competence of the students.										3		2	-	-
		2	Understand international market and Inter-Cultural Communication.									2			2	-	-
		3	Analyze and overcome barriers of communication										3		2	-	-
		4	Understand and practice better interpersonal communication										2		2	-	-
		5	Develop leadership skills and team spirit.									3			2	-	-
		6	Apply negotiation skills and ethics in Business Communication.								2				2	-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Competitive Programming-I (BTCOC506)	1	Understand online judge platform and use it for program evaluation		1	1											1
		2	Apply Elementary Data Structures to solve programming problems	1	2	2										1	2
		3	Apply strings to solve programming problems		3	2	1	2								1	2
		4	Apply Sorting technics to solve programming problems		1	1	1									1	2
		5	Apply Arithmetic and Algebra to solve programming problems	1	1	1	2									1	2
		6	Apply Combinatorics Data Structures to solve programming problems	1	2	2	2									1	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Database Systems Lab (BTCOL507)	1	Model, design databases for real life applications and depict a database system using E-R Diagram						3			3	3			3	
		2	To conceptualize and depict a database system Relational Algebra and Calculus													3	
		3	Understand SQL and Understand validation framework using Normalization.						3			3	3			3	
		4	To understand Query processing.													3	
		5	To understand File Organization, Indexing & Hashing													3	
		6	To Understand transaction concepts and techniques.													3	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Machine Learning Lab (BTCOL508)	1	Understand the basic concepts and different models of learning.	1	1										1		
		2	Understand and apply probabilistic machine learning.			2	2	1								2	1
		3	Apply basic machine learning algorithms like regression and classification.		3	3	3								2	2	1
		4	Understand and apply artificial neural network to real world problems.			2	2	1								2	1
		5	Design hybrid machine learning model.		3		3	2							2	2	1
		6	Demonstrate unsupervised learning using clustering.		3		3	2							2	2	1

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Seminar (BTCOS509)	1	State the exact title of the seminar	2					2	2	2	2	1		1	3	2
		2	Explain the motivation for selecting the seminar topic and its scope								2		2		1	3	2
		3	Search pertinent literature and information on the topic			2			1	1	1	3	3		3	3	2
		4	Critically review the literature and information collected	1		3			2	1	2	2	2		2	3	2
		5	Demonstrate effective written and verbal communication										3		3	3	3
		6	Will be able to understand the Research aspects related to topic		3		3								3	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Internship /Industrial Training Evaluation (BTCOF411)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Software Engineering (BTCOC701)	1	To understand the software processes and various software process model's applicability along with the ethical practices to be followed .		2	3	2				2			2		3	1
		2	To be able to analyse software requirements using requirement engineering process and develop SRS document for a project.		2				2			2	2	2		3	1
		3	To be able to apply various system and architectural modelling techniques to a software project.			2	1	1								2	
		4	To gain knowledge of software design with object oriented design approach, design patterns and its methodology.	1	1	2										3	
		5	To distinguish between different testing strategies and its applicability in various software processes.			2	1	1								3	
		6	Recognize the importance of non functional aspects and its impact on software engineering.		1	2			1								

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - VIII (A) Big Data Analytics (BTCOE702)	1	To understand and study the basic technologies that forms the foundations of Big Data.	1	2	2	2									1	
		2	To study the programming aspects with a view to big data applications.		2	2	2	1								1	1
		3	To understand and evaluate big data streaming ecosystem				2	1								1	1
		4	To understand the specialized aspects of big data including big data application, and big data analytics		2	2	2									1	1
		5	To understand, apply and create query processing on MongoDB	1			3	2								2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - VIII (B) Distributed System (BTCOE702)	1	Define basic terminology of Distributed System.	3				2									3
		2	Appreciation of the fundamentals, advantages, and challenges in designing and implementing distributed systems.	3	2			1									3
		3	Appreciation of the differences in the handling of issues like mutual exclusion, deadlock detection, fault handling, etc. in a centralized system and a distributed system.	3	2			1									3
		4	Ability to write distributed programs using sockets, RPC/RMI, etc	3	2			1									3
		5	Ability to make intelligent choices from among available algorithms and techniques for the design of distributed systems subject to specific design and performance constraints.	3	2			1									3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - VIII (C) Fundamental of Digital Image Processing (BTCOE702)	1	To understand the fundamentals of digital imaging and image transformation techniques.	1											2		
		2	Apply image enhancement techniques in both the spatial and frequency (Fourier) domains.				2	2								2	1
		3	Analyze the basic algorithms used for image compression & restoration.	1				2								2	1
		4	Apply image segmentation techniques to partition an image into its constituent parts or objects.	2		3		3								2	1
		5	Make use of techniques, skills, and modern engineering tools necessary for engineering application to real problems			2		2									

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - IX(A) - Cloud Computing (BTCOE703)	1	To understand the different levels of virtualization in the cloud system and its application in scenario specification.	3				2			2						3
		2	To understand and apply cloud services in reference to cloud models.	3				2	1								3
		3	To understand the scaling methods and to apply proper measures by analyzing the scenario.	3			2	2									3
		4	To understand and use of Aneka as a public , private and hybrid cloud model.	3			2	2									3
		5	To understand the role of cloud serves from competitors and applications view.	3			2	3			3						3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - VIII (B) - Business Intelligence (BTCOE703)	1	Understanding the need for BI with Practical skills in Business Intelligence and Decision Support to utilize the most current software products in everyday decision making; Describe the concepts and components of Business Intelligence (BI).				1			1	1					3	
		2	Understanding the BI techniques development to Understand and design the technological architecture that underpins BI systems.	2	2		1									3	
		3	Apply theoretical concepts of the course to the decision-making and BI processes and technologies in order to prepare students for making appropriate managerial decisions in future real-life situations. Through applying the practices to understand how “text book theory” works “in today’s business practices”.	1	1	1	2									3	
		4	Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of Online analytical processing (OLAP)).	1	2		2	1								3	
		5	Design Data warehouse models using appropriate schemas to meet business objectives and Apply data analysis techniques for building Decision Support System.	1	1	3	1					1		2		3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - VIII (C) - Natural Language Processing (BTCOE703)	1	Students will be able to understand the fundamental concepts of Natural Language Processing	2	2	3	2										1
		2	Students will be able to design algorithms for NLP tasks		2	3										3	2
		3	Students will be able to develop useful systems for language processing and related tasks involving text processing		2	3										3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective - X (A) Blockchain Technology (BTCOE704)	1	Illustrate the essential concepts of blockchain technology		1	1	1									2	2
		2	Explain the functioning of bitcoin cryptocurrency and various consensus algorithms.	1	2	2	2	2								2	2
		3	Distinguish between different types of blockchain and evaluate different consensus models for permissioned blockchain		1	1	1									2	2
		4	Assess different types of uses of blockchain and analyze its implementation in real-life scenarios		2	2	2	2					1			3	2
		5	Develop smart contract/chaincode using Hyperledger Fabric and Ethereum	1	2	2	2	2								3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective - X (B) Computer Graphics (BTCOE704)	1	Understand the basics of computer graphics, different graphics systems, devices, and applications of computer graphics.	1		1										1	
		2	Discuss various 2D transformation algorithms and different clipping techniques.	1		2		2								1	
		3	Understand various 3D transformations and projections techniques.	1		2		2								1	1
		4	Design Graphicaal User Interface using various graphics designing tools		1	3		2							1		1
		5	Explore fundamentals of animation and discuss its types			3	1								1		1

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective - X (C) Embedded Systems (BTCOE704)	1	Understand the fundamentals of embedded systems, including the design challenges, processor technology, and IC technology.	3	1	1	1	2	-	-	2	1	-	-	-	2	1
		2	Analyze and design custom single-purpose processors, including hardware-combinational logic, sequential logic, and RT-level design.	1	2	-	-	-	-	-	2	1	-	-	-	2	2
		3	Gain knowledge of system control in embedded systems, including pin and register description, memory mapping control, and power control.	1	1	2	1	1	-	-	1	-	-	-	-	1	1
		4	Explore the functionality and operation of communication interfaces such as UART, SPI, and I2C in embedded systems.	-	-	-	2	1	-	-	-	-	-	-	-	3	2
		5	Develop an understanding of process scheduling in embedded systems, including real-time operating systems (RTOS) and system design using simulation software.	2	-	-	1	2	-	-	2	1	-	-	-	2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective - X (D) Design Thinking (BTCOE704)	1	Gain a comprehensive understanding of the design thinking process, its models, phases, and its correlation with other philosophies. Develop knowledge of design thinking tools and their application in problem-solving, emphasizing the importance of design thinking in the business context of innovation.			2		1			1		2		1	2	
		2	Learn the role of empathy in design thinking and develop skills in empathizing with users. Acquire techniques for creating empathy maps, user personas, and customer journey mapping. Formulate effective "How might we" questions to drive the design thinking process.			1		1				1	2			1	1
		3	Develop analytical skills for root cause analysis, conflict of interest analysis, and perspective analysis in the context of design thinking. Explore big picture thinking through system operator and function modeling. Apply brainstorming techniques, metaphors, and ideation tools such as CREATE and What-If. Introduce the principles and applications of TRIZ for inventive problem-solving.		1	2	1	2			1	1			2	1	2
		4	Acquire practical skills in prototyping and validation within the design thinking process. Understand the assumptions involved and learn best practices for presenting and testing prototypes in the market.			1	2	2				1	1			1	2
		5	Understand the benefits of iteration in the design thinking process and its role in fostering design innovation. Learn how to effectively take ideas to the market and gain an introduction to innovation management within a company.				1					1	1			2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Full stack Development Lab (BTCOL705)	1	Implement the Web development features like finding Geolocation, saving Session information, Adding audio and video etc.	1	2	2										2	
		2	Implement the basic web elements and its design using HTML5, CSS and advance CSS properties.	1	2	2										2	
		3	Understand the concepts of programming and problem solving through HTML & JavaScript.		1	1										2	1
		4	Understanding the basic concepts of PHP and its applications.		2	2		1								2	1
		5	To design and develop dynamic, database-driven web applications using PHP.	2	3	3	2	2								2	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	System Administration Lab (BTCOL706)	1	To install & configure various linux flavours (8hr)	2				2								1	
		2	To install SSH and telnet server on ubuntu					2					1			1	
		3	To install FTP server on ubuntu & perform Uploading/Downloading	3				3					2			1	
		4	To install & configure http and proxy server on ubuntu	2				2								1	
		5	To install & configure samba server on ubuntu	2				2								1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective VIII Lab: Big Data Analytics Laboratory (A) (BTCOL707A)	1	Understanding of Big Data and its technologies.	1	2	2										1	1
		2	Ability to understand, apply, analyze and create Programs on Big Data Platforms		2	2	2									1	2
		3	Ability to understand, apply and analyze Big Data Applications		2	2	2									1	2
		4	Ability to understand, apply and analyze Database for the Modern Web	1		2	3	2								1	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective VIII Lab: Distributed System Lab (B) (BTCOL707B)	1	Apply the concepts of Remote Procedure Call (RPC) and Remote Method Invocation (RMI).	3												2	2
		2	Design and implement distributed applications using message passing interfaces, synchronization algorithms, and multi-threaded client/server processes.	3		3		1								2	2
		3	Configure and test server socket options, such as SO_KEEPALIVE, SO_LINGER, SO_SNDBUF, SO_RCVBUF, and TCP_NODELAY.	3		2		1								2	2
		4	Implement shared memory operations, including incrementing a counter, and study the implementation of Election and Mutual Exclusion algorithms.	3		3		1								2	2
		5	Develop Network File System (NFS) and demonstrate its functionality.	3		3		1								2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective VIII Lab: Fundamental of Digital Image Processing (C) (BTCOL707C)	1	To understand the fundamentals of digital imaging and image transformation techniques.	1											2		
		2	Apply image enhancement techniques in both the spatial and frequency (Fourier) domains.				2	2								2	1
		3	Analyze the basic algorithms used for image compression & restoration.	1				2								2	1
		4	Apply image segmentation techniques to partition an image into its constituent parts or objects.	2		3		3								2	1
		5	Make use of techniques, skills, and modern engineering tools necessary for engineering application to real problems			2		2									

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective IX Lab: Cloud Computing Laboratory (A) (BTCOL708)	1	To understand the different levels of virtualization in the cloud system and its application in scenario specification.	3				2			2						3
		2	To understand and apply cloud services in reference to cloud models.	3				2	1								3
		3	To understand the scaling methods and to apply proper measures by analyzing the scenario.	3			2	2									3
		4	To understand and use of Aneka as a public , private and hybrid cloud model.	3			2	2									3
		5	To understand the role of cloud serves from competitors and applications view.	3			2	3			3						3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective IX Lab: Business Intelligence Laboratory (B) (BTCOL708)	1	Understanding the need for BI with Practical skills in Business Intelligence and Decision Support to utilize the most current software products in everyday decision making; Describe the concepts and components of Business Intelligence (BI).				1			1	1					3	
		2	Understanding the BI techniques development to Understand and design the technological architecture that underpins BI systems.	2	2		1									3	
		3	Apply theoretical concepts of the course to the decision-making and BI processes and technologies in order to prepare students for making appropriate managerial decisions in future real-life situations. Through applying the practices to understand how “text book theory” works “in today’s business practices”.	1	1	1	2									3	
		4	Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of Online analytical processing (OLAP)).	1	2		2	1								3	
		5	Design Data warehouse models using appropriate schemas to meet business objectives and Apply data analysis techniques for building Decision Support System.	1	1	3	1					1		2		3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective IX Lab: Natural Language Processing (C) (BTCOL708)	1	Students will be able to understand the fundamental concepts of Natural Language Processing	2	2	3	2										1
		2	Students will be able to design algorithms for NLP tasks		2	3										3	2
		3	Students will be able to develop useful systems for language processing and related tasks involving text processing		2	3										3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Project Phase-I (BTCOP709)	1	Plan and manage a major project effectively, including setting goals, creating timelines, managing resources, and coordinating project activities.	1	1	2		1	1			3	3	3		3	
		2	Analyze and solve complex engineering problems in the context of the major project using appropriate analytical techniques, algorithms, and tools.	3	3		3	3			3				3	3	
		3	Design and develop innovative and practical solutions for software/hardware systems, considering factors such as performance, security, usability, and maintainability.	2	3	3	3	3							3	3	
		4	Work collaboratively in multidisciplinary project teams, communicate project requirements, progress, and outcomes effectively, and deliver presentations and documentation.				2		3	-	3	3	3	3		3	3
		5	Adhere to ethical guidelines and professional standards in conducting the major project, considering aspects such as privacy, security, intellectual property, and social impact.						3	3	3		3				3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Field Training / Internship / Industrial Training (BTCOF609)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2020-21 **Doc No : BITACAD/CO-POMapping/COMP/Even/2020-21**

Session	**Even SEMESTER**

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2020-21	Design & Analysis of Algorithms (BTCOC401)	**1**	Analyzing the time complexity of a given algorithm and data structure operations.	2													1
		2	Analyze and Design algorithms using divide and conquer approach.		1	3	2									1	2
		3	Analyze and Design algorithms using a greedy approach.		1	3	2									2	2
		4	Analyze and Design algorithms using dynamic programming		1	3	2									1	2
		5	Analyze and Design algorithms using backtracking and branch and bound techniques.		1	3	2									1	2
		6	To distinguish between P and NP classes of problems.	1			2									1	2

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2020-21	Probability & Statistics (BTCOC402)	**1**	apply Baye's theorem, basic probability axioms and rules to solve the problems, also they apply problem-solving techniques to solving real-world events.	1	3		2									2	
		2	calculate probabilities; derive the marginal and conditional distributions of bivariate random variables.	1	3		2									2	
		3	apply selected probability distributions (binomial, Poisson and normal) to solve problems.	1	3		2									1	
		4	calculate the correlation between two variables and simple linear regression equation for the set of data, also they apply the principles of linear regression and correlation (including least square method) and predict the particular value of Y for given value of X and significance the correlation coefficient.		2											2	
		5	perform the test of significance and calculate difference of proportions, single mean, difference of means, and difference of standard deviations.		3											1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Operating Systems (BTCOC403)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3		3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3		3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system							3			3		3	2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system				2						3		3	2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3		3	1	
		6	Explain concept File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3		3	1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - I (A) Object Oriented Programming in Java (BTCOE404A)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects and Introduction to Java and Java Development Environment.	1												3	2
		2	Understand and apply concepts of Classes, Objects, Methods and Strings	1				1								3	2
		3	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.		1	1		1								3	2
		4	Understand and build applications using Arrays.		1	1		1								3	2
		5	Analyze types of constructors, composition and garbage collection technics	2	2	2		3							2	3	2
		6	Design and build applications using Inheritance and Polymorphism.		2	2		2							1	3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - I (B) Object Oriented Programming in C++ (BTCOE404B)	1	Understand the principles and benefits of object-oriented programming and the object-oriented approach.	1				1		2	1	1				2	2
		2	Apply object-oriented concepts to create classes, objects, and constructors, and work with objects as data types.				1			2	2	1				2	2
		3	Implement operator overloading, inheritance, and multiple inheritance in object-oriented programming.				1			2						2	2
		4	Utilize polymorphism through virtual functions, abstract classes, and pure virtual functions.				1	1			2					2	2
		5	Work with streams, files, and stream manipulators for input/output operations and file handling.				2	1		2	1	1			2	2	2
		6	Utilize templates and exception handling mechanisms for code reusability and error management.	1			1			3	1				1	2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Product Design Engineering (BTID405)	1	Describe an engineering design and development process		3			3							1	3	2
		2	Work collaboratively on a team to successfully complete a software project	1	2	3					2	3		1	1	3	2
		3	Gather the requirements from the customers and establish technical software requirement specification		3		3						2		1	3	2
		4	Apply creative process techniques in synthesizing the solution, problem-solving and critical thinking	1	3	3	3								1	3	2
		5	Experience SDLC, innovation and research, prototyping, patenting and research publication.		1	1		3					3	3	1	3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - II A Physics of Engineering Materials (BTBS405A)	1	Understand magnetic materials and their properties, including ferromagnetism and hysteresis.	3	3	2	2										
		2	Comprehend superconductivity and its applications.	2	2	3	3	1								1	
		3	Understand semiconducting materials and their applications, including LEDs and photovoltaic cells.			1	1	1	2								
		4	Gain knowledge about dielectric materials and their applications, including ferroelectric and piezoelectric materials.					2	2	3	3					1	
		5	Explore nanomaterials, their synthesis, properties, and applications.									2	2			1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - II B Numerical Methods (BTCOE406B)	1	Apply various methods (Bisection, False Position, Newton's method, Newton-Raphson method) to solve algebraic and transcendental equations.	3	2	2	2								3	1	1
		2	Solve linear simultaneous equations using Gauss elimination, Gauss-Jordan, Jacobi iteration, Gauss-Seidal iteration, and Relaxation methods.	3	2	2	2								3	1	1
		3	Utilize finite difference operators and interpolation formulas (Forward difference, Backward difference, Central difference, Newton's interpolation) for solving problems.	3	2	2	2								3	1	1
		4	Apply numerical techniques (Newton-Cortes formula, Trapezoidal rule, Simpson's rules) for differentiation and integration.	3	2	2	2								3	1	1
		5	Implement numerical methods (Picard's methods, Taylor series, Euler's method, Modified Euler's method, Runge-Kutta method) for solving ordinary differential equations.	3	2	2	2								3	1	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - II C Soft skills and Personality Development (BTHM3402)	1	Acquire interpersonal communication skills								1					-	-
		2	Develop the ability to work independently.										2			-	-
		3	Develop the qualities like self-discipline, self-criticism and self-management.												2	-	-
		4	Have the qualities of time management and discipline									1				-	-
		5	Present themselves as an inspiration for others										2			-	-
		6	Develop themselves as good team leaders											3		-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Design & Analysis of Algorithms Lab (BTCOL407)	1	Analyzing the time complexity of a given algorithm and data structure operations.	1												1	
		2	Analyze and Design algorithms using divide and conquer approach.			2	1									2	2
		3	Analyze and Design algorithms using a greedy approach.			2	1									2	2
		4	Analyze and Design algorithms using dynamic programming			3	2									2	2
		5	Analyze and Design algorithms using backtracking and branch and bound techniques.			3	2									2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Introduction to Data Science with R (BTCOL408)	1	Introduction to basic data types in R	1												1	
		2	Apply R paradigm to work with vectors and matrices			2	1									2	2
		3	Apply R paradigm to work with fractors and data frames			2	1									2	2
		4	Apply R paradigm to work with lists			3	2									2	2
		5	Using R's packages graphics and data visualizations			3	2									2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Object Oriented Programming Lab (BTCOL409)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects and Introduction to Java and Java Development Environment.	1												3	3
		2	Understand and apply concepts of Classes, Objects, Methods and Strings	1		1		1								3	3
		3	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods		1	1		1								3	3
		4	Understand and build applications using Arrays.(2)		2	2	1	2								3	3
		5	Analyze types of constructors, composition and garbage collection technics	2	3	3		3							2	3	3
		6	Design and build applications using Inheritance and Polymorphism.		2	2		2							1	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Operating System Lab (BTCOL410)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3		3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3		3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system							3			3		3	2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system				2						3		3	2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3		3	1	
		6	Explain concept of File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3		3	1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Compiler Design (BTCOC601)	1	Discuss the major phases of compilers and use the knowledge of the Lex tool	3	3			1									3
		2	To understand and apply the logic of assembling a NFA from regular expression.	3	3												3
		3	To understand and differentaite the logics behind top down paring and bottum up parsing	3	3	2	2										3
		4	Describe intermediate code representations using syntax trees and DAG's.	3	3	2	1										3
		5	Understand the use of procedural calls in intermediate code generation.	3	3	1	2										3
		6	Summarize various optimization techniques used for dataflow analysis and generate machine code from the source code of a novel language.	3	3	2	2										3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Computer Networks (BTCOC602)	1	Develop an understanding of modern network architectures , study protocols, network standards, the OSI model,TCP/IP model.				3									2	2
		2	Study different LAN,WI-FI and Wireless technologies.				3									2	2
		3	Study different error correcting and detecting codes.	3												2	3
		4	Study IP addressing scheme , routing algorithms ,ability to write program using socket programming.			3										2	3
		5	Study different application protocols.					3								2	2
		6	Ability to understand basic concepts of network security using cryptographic techniques.								3					2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – V (A) Human Computer Interaction (BTCOE603)	1	[HCCO1] Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.	1												3	
		2	[HCCO2] Describe the key design principles for user interfaces.			2		3	3							3	
		3	[HCCO3] Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems.			3	2		2							2	
		4	[HCCO4] Develop and implement a process to gather requirements for, engage in iterative design of, and evaluate the usability of a user interface.				3	2	2							2	
		5	[HCCO5] Demonstrate and knowledge of human computer interaction design concepts and related methodologies. with effective work design to real-world application.									2	2			2	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – V (B) Artificial Intelligence (BTCOE603)	1	Understand the notions of rational behavior and intelligent agents.			1										2	1
		2	Analyze and formalize the given problem as a state space search, design heuristics and select amongst different search or game based techniques to solve them.			3	3				3				1	2	1
		3	Develop intelligent algorithms for constraint satisfaction problems.			2	2									2	1
		4	Design intelligent systems for game playing in a competitive environment.			2	2									2	
		5	Attain the capability to represent various real life problem domains using logic based techniques and use this to perform reasoning and planning.	2							2					1	1
		6	Formulate and solve problems with uncertain information using Bayesian approaches.	2							2					1	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – V (C) Object-Oriented Analysis Design (BTCOE603)	1	To understand basic object oriented programming concepts like objects, classes, encapsulation,polymorphism and abstraction.	1										1		2	
		2	To understand various types of structural and behavioral diagrams and to draw them for real life applications.		3	2		2					2			1	
		3	To analyze problems using use cases and CRC card analysis methods.		2	1											
		4	To understand and distinguish various design patterns.		2		2									1	
		5	To implement various object oriented analysis and design concepts.		2	1								3		1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – VI (A) Geographic Information System (BTCOE604)	1	Understand basic concepts associated with GIS	1												2	2
		2	Understand apply and differentiate vector, raster and TIN		2											2	2
		3	Understand Digital Elevation Model (DEM), its resolutions and apply preprocessing techniques.		2	2										2	2
		4	Analyze Digital Elevation Model (DEM) and enhance its quality		2		2	2		1			2			1	2
		5	Application of GIS tools for identification of errors.	1	2		3	3		2			2			3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – VI (B) Biology (BTCOE604)	1	Outline the biological process, principles and applications				1										
		2	Classify the theories of origin of life, based on their types, structure and characteristics		1	1				1							
		3	Expand the information of living systems evolution and to consider the systems in relationship to the self and ecosystem function				1			1							
		4	Demonstrate the ability to describe and discuss the methods used to demonstrate the functions of the cell systems in the body						1	1							
		5	Know the basics of recombination in Prokaryotes cells						1	1							
		6	Interpret various aspects of Biological System, its principles and applications														

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective – VI (C) Internet of Things (BTCOE604)	1	Understand and describe basics of IoT and able to identify the components that forms a part of Architecture.	2												-	-
		2	Understand the concept of sensors and actuators in terms of “Things” in IoT and role of Communication Technologies.	2			3									2	1
		3	Understand and evaluate appropriate communication protocol for IoT systems.	1			3									2	3
		4	Understand and appreciate the roll of Machine Learning, Big Data, and Data Analytics in IoT systems.	3	2	2	2	2								3	2
		5	Apply the knowledge and skill acquired to build and test a complete working IoT system involving prototype programming	3	2	2		3								3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective – VII (A) Development Engineering (BTCOE605)	1	Demonstrate understanding of the principles of Development Engineering						1							1	2
		2	Understand the state of poverty in India via various human development indexes and understand the role of the engineer in sustainable development and engineering ethics.	1			2		2							1	2
		3	Analyze the social justice system for the parameters of human dignity, equal rights and social inclusion, along with environmental justice and be able to explain how social philosophies impact the appropriateness and sustainability of engineering solutions.	1			2			1						2	2
		4	Learn about implementation of development strategies via perspectives of social, technological, economic, health, education and business.			2		2		2		2				2	1
		5	Apply engineering knowledge and skills to a real-world humanitarian problem via participatory development through a technical design project, considering complex social factors and the unique needs of stakeholders and present the result in both verbal and written forms.	2		2	3			3			2			3	2
		6	Implement Modern tools of information technology, Machine Learning and block chain for Social Development.					1								3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective – VII (B) National Social Service (BTCOE605)	1	Understand the history, philosophy, aims & objectives of NSS, organizational structure, regular activities, special camping, and survey methodology.								3						
		2	Define youth, explore their profiles, categories, and their role as agents of social change; emphasize youth-adult partnership, community mobilization, and the importance of volunteerism.						2		3	3	1			1	
		3	Recognize the meaning and types of leadership, the qualities and traits of good leaders, and the significance of youth leadership.						2		2	2	1			1	
		4	Develop life competencies including communication, problem-solving, positive thinking, self-confidence, goal setting, stress, and time management.		2	3	2		2		3	1	3				
		5	Explore social harmony, national integration, and the role of youth in peace-building, conflict resolution, and nation-building.						2		3	3	2			1	
		6	Understand the National Youth Policy, youth development programs at national, state, and voluntary levels, and youth-focused/led organizations in India.								2	2					

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective – VII (C) Consumer Behaviour (BTCOE605)	1	Understand the scope, application ,importance and evolution of consumer behaviour														
		2	LEarn Market segmentation and understand the consumer decisionmaking process that leads to buying		1		1										
		3	Learn about models of consumer behavior		1		1										
		4	Be aware about the psychological and sociological influences on consumer decision making														
		5	Learn consumer behavior and maketing strategy		1		1										
		6	Understand multiplicative innovation model and Seth model of industrial buying				1										

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Competitive Programming-II (BTCOC606)	1	ApplyNumber theory Structures to solve programming problems		1	1											1
		2	Apply Backtracking to solve programming problems	1	2	2										1	2
		3	Apply Graph Traversals to solve programming problems		3	2	1	2								1	2
		4	Apply Graph Algorithms to solve programming problems		1	1	1									1	2
		5	Apply Dynamic Programming to solve programming problems	1	1	1	2									1	2
		6	Apply Grids to solve programming problems	1	2	2	2									1	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	(A) Mobile Application Development (BTCOL607)	1	Develop a solid foundation in Swift programming, including data types, operators, control flow, and basic app development concepts.	1											2	2	
		2	Gain proficiency in UI Kit and its components, such as views, controls, and Auto Layout, to create responsive user interfaces for iOS apps.			2		3									2
		3	Acquire skills in navigating and structuring app workflows using navigation controllers, tab bar controllers, and segues, while effectively handling optionals and enumerations in Swift.		2	2											
		4	Implement data persistence techniques, image handling, and data sharing functionalities in iOS apps, utilizing scroll views, table views, and the user's photo library.				2										
		5	Apply advanced concepts like animations, concurrency, and web service integration to develop interactive and dynamic iOS apps, culminating in the successful completion of a self-designed app project.														

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	(A) Internet of Things Laboratory (BTCOL607)	1	Develop server applications & corresponding client application for Arduino/Raspberry Pi by interfacing of various sensors having ability to upload/download sensor data transmitted wirelessly between different devices	2	3	3	2	2	2						2	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Computer Networks Lab (BTCOL608)	1	Develop an understanding of modern network architectures , study protocols, network standards, the OSI model,TCP/IP model.				3	3								2	3
		2	Study different LAN,WI-FI and Wireless technologies.				3	3								2	3
		3	Study different error correcting and detecting codes.	3				3								2	3
		4	Study IP addressing scheme , routing algorithms ,ability to write program using socket programming.					3								2	3
		5	Study different application protocols.					3								2	3
		6	Ability to understand basic concepts of network security using cryptographic techniques.					3			3					2	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective XI(A): Deep Learning (BTCOE801)	1	Understand the fundamental concepts and principles of machine learning, including feature descriptors, Bayesian learning, and discriminant functions.	3	2	-	-	-	-	-	-	-	-	-	-	2	-
		2	Apply linear classifiers, support vector machines, and optimization techniques in machine learning to solve classification problems.	2	3	3	3	-	-	-	-	-	-	-	-	2	-
		3	Comprehend the basics of neural networks, including multilayer perceptrons, backpropagation learning, and loss functions.	2	3	3	3	2	-	-	-	-	-	-	-	2	-
		4	Explore the capabilities and applications of autoencoders, including their comparison with principal component analysis (PCA) and different variants of autoencoders.	2	3	3	3	2	-	-	-	-	-	-	-	2	-
		5	Gain knowledge of convolutional neural networks (CNNs) and their architectures, including popular models like LeNet, AlexNet, VGG16, and GoogleNet.	2	3	3	3	2	-	-	-	-	-	-	-	3	2
		6	Familiarize oneself with advanced topics in deep learning, such as optimization algorithms, normalization techniques and various applications	2	3	3	3	2	-	-	-	-	-	-	-	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective XI(B): Social Networks (BTCOE801)	1	Understand network analysis fundamentals and apply basic techniques using Python and Networkx.	3	3	1											3
		2	Apply the network concepts such as homophily and structural balance of the network using Networkx.	3			3	3								3	
		3	Explore social network structures, dynamics, and simulate social phenomena using relevant models.	3			3									3	
		4	Apply advanced techniques in network community detection and interpret communities using Gephi.	3	3	3	3									3	
		5	Investigate balanced networks, relationship dynamics, and implement algorithms for network transformation.	3		3	3									3	
		6	Understand PageRank and diffusion in networks, analyze their impact, and model information spread.	3	3	1	3	3								3	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Elective - XI (C) BTCOE801 (C): Randomized Algorithms	1	CO1: Understand randomized algorithms and their applications.	2	2	1	1	1			1	1	2		3	3	3
		2	CO2: Apply probability concepts to analyze randomized algorithms.	3	3	1	2	1			1	1	3		3	2	3
		3	CO3: Explore advanced topics in randomized algorithms.	2	2	2	2	1			1	1	2		3	3	3
		4	CO4: Analyze and design efficient algorithms for permutation routing.	2	2	3	3	2	1	1	2	2	2	1	3	3	3
		5	CO5: Gain knowledge of computational complexity concepts.	1	1			1					1		2	2	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective XII (A): Introduction to Industry 4.0 and Industrial Internet of Things (BTCOE802)	1	Understand the fundamental concepts of Industry 4.0, including sensing, actuation, communication, and networking.	3	2											2	
		2	Analyze the impact of Industry 4.0 on globalization, emerging issues, and smart and connected business perspectives.		1		1		3	-	3				3		
		3	Explore the technologies behind Industry 4.0, such as cyber-physical systems, next-generation sensors, augmented reality, artificial intelligence, and big data analytics.					2								2	2
		4	Evaluate the importance of cybersecurity in the context of Industry 4.0 and grasp the basics of industrial IoT, including industrial processes, sensing and actuation, and industrial internet systems.				3				3					2	
		5	Examine the business models and reference architectures of industrial IoT, focusing on IIoT business models, IIoT reference architecture, and IIoT layers including sensing, processing, communication, and networking.		3		3	2			3						
		6	Apply advanced concepts in Industrial IoT, including big data analytics, software-defined networks, security, fog computing, and explore various application domains		2	3		3	3		3		3	3	3		

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective - XII(B) BTCOE802 (B): Cryptography & Network Security	1	Understand the fundamentals of cryptography and its applications.	2	1	2			1		2	1	2	1	2		2
		2	Analyze classical cryptosystems and their vulnerabilities.	1	2	1	1	1	1	1	2	1	2	1	2		2
		3	Apply cryptanalysis techniques, including frequency analysis, to break substitution ciphers.		1	1	2		1		1	1	1		2	2	2
		4	Implement and analyze the Playfair cipher.	1	1	2	1	1	1	1	1	1	2	1	2	2	2
		5	Explore block ciphers and their modes of operation.	1	1	1	1	1	1	1	1	1	1	1	2	2	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Open Elective - XII (C) BTCOE802 (C): Model Checking	1	Understand the principles and techniques of modeling code behavior and its application.	3	1												2
		2	Analyze and model hardware circuits using appropriate tools and methodologies.	2	3	2	3										2
		3	Apply modeling techniques to capture and analyze data-dependent programs.	2	2	3	1	2								2	2
		4	Model concurrent systems and analyze their behavior.	1				3								2	2
		5	Utilize model checking tools for verification and validation of system models.	1				3								2	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2020-21	Project phase - II (In-house) $ /Internship and project in the Industry (BTCOE803)	1	Plan and manage a major project effectively, including setting goals, creating timelines, managing resources, and coordinating project activities.	1	1	2		1	1			3	3	3	2	3	
		2	Analyze and solve complex engineering problems in the context of the major project using appropriate analytical techniques, algorithms, and tools.	3	3		3	3			3				3	3	
		3	Design and develop innovative and practical solutions for software/hardware systems, considering factors such as performance, security, usability, and maintainability.	2	3	3	3	3							3	3	
		4	Work collaboratively in multidisciplinary project teams, communicate project requirements, progress, and outcomes effectively, and deliver presentations and documentation.				2		3		3	3	3	3		3	3
		5	Adhere to ethical guidelines and professional standards in conducting the major project, considering aspects such as privacy, security, intellectual property, and social impact.						3	3	3		3				3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2019-20

Doc No : BITACAD/CO-POMapping/COMP/Odd/2019-20

Session	**ODD SEMESTER**

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2019-20	Engineering Mathematics – III (BTBSC301)	**1**	Understand the concept of Laplace transform and inverse Laplace transform of elementary functions and apply it to solve the linear differential equations with constant coefficients having their applications in mechanical, electrical, chemical, communication etc. systems.	3	2											1	
		2	Apply the concept of Fourier transform to solve the boundary value problems, problems in signal processing and communication system.	2	2											2	
		3	Apply partial differential equations to solve heat equation, wave equation and Laplace equation etc.	3	2											1	
		4	Analyze conformal mapping, transformation and perform contour integration of complex function in the study of electromagnetics and signal processing.	3	2											2	

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2019-20	Discrete Mathematics (BTCOC302)	**1**	To understand the basic principles of sets and operations.	3											1	1	
		2	To demonstrate an understanding of relations and functions and to determine their properties.	3											1	1	
		3	To understand different methods in combinatorics.	2			2								1	2	
		4	To model problems in Computer Science using graphs.	2	2										1	2	
		5	To model problems in Computer Science using trees.	2	2										1	2	
		6	To understand various algebraic structures and their properties.	2											1	2	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Data Structures (BTCOC303)	1	To understand the basic terminologies of Data Structures	1	1												1
		2	To understand and apply Concept of sequential organization and hashing	2	3	3	2										2
		3	To understand, apply and evaluate various searching and sorting techniques.		2	2	1										2
		4	To design and implement various types of linked lists and its various applications		2	1											2
		5	To understand and implement stacks, queues data structures and their applications	2	3	3	2										2
		6	To implement concepts from trees and graphs to explore algorithms based on them.	2	3	3	2										2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Computer Architecture & Organization (BTCOC304)	1	To understand the basic hardware and software issues of computer organization			3										1	2
		2	Identify functional units,bus structure and addressing modes.		3										3	1	2
		3	Students will be able to identify where,when and how enhancements of computer performance can be accompolished.	3					3						3	1	2
		4	Identify memory hierarchy and performance.					3							3	1	2
		5	To understand control unit design.		3	3									3	1	2
		6	To understand input/output organization and pipelining			3									3	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Digital Electronics & Microprocessors (BTCOC305)	1	Understand the fundamental concepts and structure of various number systems and its applications along with concepts of digital electronics.	2	3	3										2	
		2	Ability to understand, analyse and design various combinational circuits	2	3	3										2	
		3	Ability to understand, analyse and design various sequential circuits	2	3	3	2									2	3
		4	Understand the internal architecture of microprocessors along with fundamental concepts of 8,16 and 32 bit microprocessors.		3	3										2	
		5	Understand the concepts of memory and its interfacing with microprocessors.		3	3										2	
		6	Apply knowledge and demonstrate programming proficiency using various logical, arithmetic and data transfer instructions of the target microprocessor.		3	3	3									2	3

Course Code Change

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Basic Human Rights (BTHM3401)	1	Understand the history of human rights.								2	1	1		2	-	-
		2	Learn to respect others caste, religion, region and culture.								2	1	2		2	-	-
		3	Be aware of their rights as Indian citizen.								2	1	1		2	-	-
		4	Understand the importance of groups and communities in the society.								2	3	3		2	-	-
		5	Realize the philosophical and cultural basis and historical perspectives of human rights.								2				2	-	-
		6	Make them aware of their responsibilities towards the nation.								2	1	2		2	-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Python Programming (BTCOL306)	1	Understand the concepts of programming and problem solving through python programming	3	3	2	3	3					2			3	3
		2	Implement the basic constructs of programming language like variables, loops, assignments, strings etc.	3	3	2	2	3					2			3	1
		3	Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.	3	2	2	3	3					2			3	1
		4	Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.	3	3	3	2	3					2			3	1
		5	Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems.	2	1	2	1	3					2			3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	HTML and JavaScript (BTCOL307)	1	To learn the concepts of web development process and project management by using various web technologies.	2		3						2		2		2	
		2	To learn evolution of markup languages and create hyperlinks,webforms,tables,frames,GUI in HTML.	2		2										2	
		3	To make use of web development tools for faster implementation of web projects.	2		2		2								1	
		4	Create tables, including strategies for inserting and styling tables, importing data into tables, and sorting data within tables in CSS.	2		2										1	
		5	Develop efficiency with basic javascript operators and number methods, including arithmetic operators, comparison operators,functions and trouble shooting.	2		2		3								1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Data Structures Lab (BTCOL308)	1	To understand the basic terminologies of Data Structures (4)	1	1												1
		2	To understand and apply Concept of sequential organization and hashing(2)	2	3	2	2										2
		3	To understand, apply and evaluate various searching and sorting techniques.(2)		2	1	1										2
		4	To design and implement various types of linked lists and its various applications(4)		1	1											2
		5	To understand and implement stacks, queues data structures and their applications(6)	2	3	2	2										2
		6	To implement concepts from trees and graphs to explore algorithms based on them.(2)	2	3	2	2										2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Digital Electronics & Microprocessor Lab (BTCOL309)	1	Apply digital logic principles to design and implement Boolean expressions, arithmetic circuits, and code converters.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		2	Construct and analyze various types of adders, subtractors, and comparators using logic gates.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		3	Implement led display drivers using decoder chips and understand the use of priority encoders.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		4	Verify the truth tables of various flip-flops and implement sequential circuits, including counters and sequence generators.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
		5	Design and implement finite state machines (FSM) in both Moore and Mealy machine configurations.	2	2	3	1	-	-	-	-	-	-	-	-	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Field Training / Internship /Industrial Training Evaluation (BTES211P)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Database Systems (BTCOC501)	1	Model, design databases for real life applications and depict a database system using E-R Diagram and learn data models.					3					3			3	
		2	To conceptualize and depict a database system Relational Algebra and Calculus		3	3										3	
		3	formulate SQL queries on the respect data and Understand validation framework using Normalization.			3		3					3			3	
		4	To understand Query processing.	3		3										3	
		5	To understand File Organization, Indexing & Hashing							3						3	
		6	To Understand transaction concepts and techniques.							3						3	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Theory of Computations (BTCOC502)	1	Outline the concept of Finite Automata and Regular Expression	3	2	2											3
		2	Illustrate the design of Context Free Grammar for any language set	3	2												3
		3	Demonstrate the push down automaton model for the given language	3	2	2		1									3
		4	Make use of Turing machine concept to solve the simple problems	3	2	2											3
		5	Explain decidability or undecidability of various problems	3	2												3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Machine Learning (BTCOC503)	1	Understand the basic concepts and different models of learning.	1	1										1		
		2	Understand and apply probabilistic machine learning.			2	2	1								2	1
		3	Apply basic machine learning algorithms like regression and classification.		3	3	3								2	2	1
		4	Understand and apply artificial neural network to real world problems.			2	2	1								2	1
		5	Design hybrid machine learning model.		3		3	2							2	2	1
		6	Demonstrate unsupervised learning using clustering.		3		3	2							2	2	1

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – III (A) Introduction to Research (BTCOE504)	1	Develop understanding on various kinds of research, objectives of doing research, research process, research designs and its methodologies.	2			1				2					2	
		2	Identify appropriate research topics and define apt research problems with parameters in using quantitative and qualitative research.	3			1				2					2	
		3	Describe the inductive nature of qualitative data analysis and apply adequate knowledge on measurement & scaling techniques for modelling.	3		3	2					3				2	
		4	Demonstrate effective oral and written communication skills in the professional context during research conduction.	3			3					3				2	
		5	Demonstrate effective oral and written communication skills in the professional context with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research conduction.				3					3				2	
		6	Organize and conduct research (advanced project) in a more appropriate manner													2	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – III (B) Cyber Laws (BTCOE504)	1	Gain a comprehensive understanding of computers, the internet, and cyber laws, along with the conceptual framework of e-commerce and e-governance. Understand the role of electronic signatures in facilitating e-commerce within the context of a free market economy in India.		1		3		2		2				2		1
		2	Develop knowledge and understanding of the legal aspects surrounding electronic records and digital signatures. Learn about the rules and regulations governing certifying authorities in India and explore the protection of intellectual property rights in cyberspace within the Indian legal framework.		2		2		2						2		1
		3	Explore international efforts and initiatives concerning cyberspace laws. Gain familiarity with the Council of Europe (COE) Convention on Cyber Crimes and understand the global legal landscape of cyberspace laws.		2		2		2						2		1
		4	Acquire knowledge of the penalties, compensation, and adjudication procedures for violations of provisions under the IT Act. Learn about important offences under the cyberspace law and the internet in India, as well as other offences outlined in the Information Technology Act.			2			2		1				2		1
		5	Understand the role of electronic evidence in legal proceedings. Familiarize yourself with the miscellaneous provisions of the Information Technology Act, as amended up to 2008. Learn about the Information Technology (Certifying Authorities) Rules, 2000, and gain awareness of the Ministerial Order on Blocking of Websites.		3		3		2						2		1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – IV (A) Economics and Management (BTCOE505)	1	Analyze market equilibrium, elasticity of demand, and cost-volume-profit relationships					1								-	-
		2	Analyze financial statements for variance analysis and budgeting					2								-	-
		3	Compare alternative investment options					2								-	-
		4	Apply depreciation accounting methods					2								-	-
		5	Understand the process of product development													-	-
		6	Understand the basics of inventory management and supply chain management													-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – IV (B) Business Communication (BTCOE505)	1	Develop communication competence of the students.										3		2	-	-
		2	Understand international market and Inter-Cultural Communication.									2			2	-	-
		3	Analyze and overcome barriers of communication										3		2	-	-
		4	Understand and practice better interpersonal communication										2		2	-	-
		5	Develop leadership skills and team spirit.									3			2	-	-
		6	Apply negotiation skills and ethics in Business Communication.								2				2	-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Competitive Programming-I (BTCOC506)	1	Understand online judge platform and use it for program evaluation		1	1											1
		2	Apply Elementary Data Structures to solve programming problems	1	2	2										1	2
		3	Apply strings to solve programming problems		3	2	1	2								1	2
		4	Apply Sorting technics to solve programming problems		1	1	1									1	2
		5	Apply Arithmetic and Algebra to solve programming problems	1	1	1	2									1	2
		6	Apply Combinatorics Data Structures to solve programming problems	1	2	2	2									1	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Database Systems Lab (BTCOL507)	1	Model, design databases for real life applications and depict a database system using E-R Diagram						3			3	3			3	
		2	To conceptualize and depict a database system Relational Algebra and Calculus													3	
		3	Understand SQL and Understand validation framework using Normalization.						3			3	3			3	
		4	To understand Query processing.													3	
		5	To understand File Organization, Indexing & Hashing													3	
		6	To Understand transaction concepts and techniques.													3	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Machine Learning Lab (BTCOL508)	1	Analyze The Relationship Between Variables And Make Predictions Using The Regression Model.	2	3	3	2	2	-	-	-	-	-	-	-	2	1
		2	Analyze And Implement The Decision Tree, Svm, Logistic Regression And Invesigate Its Effectiveness In Handling Classification Tasks	2	3	3	2	2	-	-	-	-	-	-	-	2	1
		3	Implement The K-Nearest Neighbor Algorithm And Analyze Its Performance By Considering Different Distance Metrics And Varying The Number Of Neighbors.	2	3	3	2	2	-	-	-	-	-	-	-	2	1
		4	Develop Proficiency In Implementing The Random Forest Algorithm And Analyze Its Performance In Solving Classification And Regression Tasks.	2	3	3	2	2	-	-	-	-	-	-	-	2	1
		5	Implement K-Means Clustering Considering Various Distance Metrics And Cluster Evaluation Measures, And Analyze Its Effectiveness In Grouping Data Points Into Distinct Clusters.	2	3	3	2	2	-	-	-	-	-	-	-	2	1

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Seminar (BTCOS509)	1	State the exact title of the seminar	2					2	2	2	2	1		1	3	2
		2	Explain the motivation for selecting the seminar topic and its scope								2		2		1	3	2
		3	Search pertinent literature and information on the topic			2			1	1	1	3	3		3	3	2
		4	Critically review the literature and information collected	1		3			2	1	2	2	2		2	3	2
		5	Demonstrate effective written and verbal communication										3		3	3	3
		6	Will be able to understand the Research aspects related to topic		3		3								3	3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Internship /Industrial Training Evaluation (BTCOF411)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2019-20

Doc No : BITACAD/CO-POMapping/COMP/Even/2019-20

Session	**Even SEMESTER**

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2019-20	Design & Analysis of Algorithms (BTCOC401)	**1**	Analyzing the time complexity of a given algorithm and data structure operations.	2													1
		2	Analyze and Design algorithms using divide and conquer approach.		1	3	2									1	2
		3	Analyze and Design algorithms using a greedy approach.		1	3	2									2	2
		4	Analyze and Design algorithms using dynamic programming		1	3	2									1	2
		5	Analyze and Design algorithms using backtracking and branch and bound techniques.		1	3	2									1	2
		6	To distinguish between P and NP classes of problems.	1			2									1	2

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2019-20	Probability & Statistics (BTCOC402)	**1**	apply Baye's theorem, basic probability axioms and rules to solve the problems, also they apply problem-solving techniques to solving real-world events.	1	3		2									2	
		2	calculate probabilities; derive the marginal and conditional distributions of bivariate random variables.	1	3		2									2	
		3	apply selected probability distributions (binomial, Poisson and normal) to solve problems.	1	3		2									1	
		4	calculate the correlation between two variables and simple linear regression equation for the set of data, also they apply the principles of linear regression and correlation (including least square method) and predict the particular value of Y for given value of X and significance the correlation coefficient.		2											2	
		5	perform the test of significance and calculate difference of proportions, single mean, difference of means, and difference of standard deviations.		3											1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Operating Systems (BTCOC403)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3		3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3		3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system							3			3		3	2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system				2						3		3	2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3		3	1	
		6	Explain concept File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3		3	1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective - I (B) Object Oriented Programming in Java (BTCOE404B)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects and Introduction to Java and Java Development Environment.	1												3	2
		2	Understand and apply concepts of Classes, Objects, Methods and Strings	1				1								3	2
		3	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.		1	1		1								3	2
		4	Understand and build applications using Arrays.		1	1		1								3	2
		5	Analyze types of constructors, composition and garbage collection technics	2	2	2		3							2	3	2
		6	Design and build applications using Inheritance and Polymorphism.		2	2		2							1	3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective - I (A) Object Oriented Programming in C++ (BTCOE404A)	1	CO1: Understand the principles and benefits of object-oriented programming and the object-oriented approach.	1				1		2	1	1				2	2
		2	CO2: Apply object-oriented concepts to create classes, objects, and constructors, and work with objects as data types.				1			2	2	1				2	2
		3	CO3: Implement operator overloading, inheritance, and multiple inheritance in object-oriented programming.				1			2						2	2
		4	CO4: Utilize polymorphism through virtual functions, abstract classes, and pure virtual functions.				1	1			2					2	2
		5	CO5: Work with streams, files, and stream manipulators for input/output operations and file handling.				2	1		2	1	1			2	2	2
		6	CO6: Utilize templates and exception handling mechanisms for code reusability and error management.	1			1			3	1				1	2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Product Design Engineering (BTID405)	1	Describe an engineering design and development process		3			3							1	3	2
		2	Work collaboratively on a team to successfully complete a software project	1	2	3					2	3		1	1	3	2
		3	Gather the requirements from the customers and establish technical software requirement specification		3		3						2		1	3	2
		4	Apply creative process techniques in synthesizing the solution, problem-solving and critical thinking	1	3	3	3								1	3	2
		5	Experience SDLC, innovation and research, prototyping, patenting and research publication.		1	1		3					3	3	1	3	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective - II A Physics of Engineering Materials (BTBS405A)	1	Understand magnetic materials and their properties, including ferromagnetism and hysteresis.	3	3	2	2										
		2	Comprehend superconductivity and its applications.	2	2	3	3	1								1	
		3	Understand semiconducting materials and their applications, including LEDs and photovoltaic cells.			1	1	1	2								
		4	Gain knowledge about dielectric materials and their applications, including ferroelectric and piezoelectric materials.					2	2	3	3					1	
		5	Explore nanomaterials, their synthesis, properties, and applications.									2	2			1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective - II A Numerical Methods (BTCOE406B)	1	Apply various methods (Bisection, False Position, Newton's method, Newton-Raphson method) to solve algebraic and transcendental equations.	3	2	2	2								3	1	1
		2	Solve linear simultaneous equations using Gauss elimination, Gauss-Jordan, Jacobi iteration, Gauss-Seidal iteration, and Relaxation methods.	3	2	2	2								3	1	1
		3	Utilize finite difference operators and interpolation formulas (Forward difference, Backward difference, Central difference, Newton's interpolation) for solving problems.	3	2	2	2								3	1	1
		4	Apply numerical techniques (Newton-Cortes formula, Trapezoidal rule, Simpson's rules) for differentiation and integration.	3	2	2	2								3	1	1
		5	Implement numerical methods (Picard's methods, Taylor series, Euler's method, Modified Euler's method, Runge-Kutta method) for solving ordinary differential equations.	3	2	2	2								3	1	1

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective - II C Soft skills and Personality Development (BTHM3402)	1	Acquire interpersonal communication skills								1					-	-
		2	Develop the ability to work independently.										2			-	-
		3	Develop the qualities like self-discipline, self-criticism and self-management.												2	-	-
		4	Have the qualities of time management and discipline									1				-	-
		5	Present themselves as an inspiration for others										2			-	-
		6	Develop themselves as good team leaders											3		-	-

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Design & Analysis of Algorithms Lab (BTCOL407)	1	Analyzing the time complexity of a given algorithm and data structure operations.	1												1	
		2	Analyze and Design algorithms using divide and conquer approach.			2	1									2	2
		3	Analyze and Design algorithms using a greedy approach.			2	1									2	2
		4	Analyze and Design algorithms using dynamic programming			3	2									2	2
		5	Analyze and Design algorithms using backtracking and branch and bound techniques.			3	2									2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Introduction to Data Science with R (BTCOL408)	1	Introduction to basic data types in R	1												1	
		2	Apply R paradigm to work with vectors and matrices			2	1									2	2
		3	Apply R paradigm to work with fractors and data frames			2	1									2	2
		4	Apply R paradigm to work with lists			3	2									2	2
		5	Using R's packages graphics and data visualizations			3	2									2	2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Object Oriented Programming Lab (BTCOL409)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects and Introduction to Java and Java Development Environment.	1												3	3
		2	Understand and apply concepts of Classes, Objects, Methods and Strings	1		1		1								3	3
		3	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.		1	1		1								3	3
		4	Understand and build applications using Arrays.		2	2	1	2								3	3
		5	Analyze types of constructors, composition and garbage collection technics	2	3	3		3							2	3	3
		6	Design and build applications using Inheritance and Polymorphism.		2	2		2							1	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)											PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Operating System Lab (BTCOL410)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3		3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3		3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system							3			3		3	2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system				2						3		3	2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3		3	1	
		6	Explain concept of File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3		3	1	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Compiler Design (BTCOC601)	1	Discuss the major phases of compilers and use the knowledge of the Lex tool	3	3			1									3
		2	To understand and apply the logic of assembling a NFA from regular expression.	3	3												3
		3	To understand and differentaite the logics behind top down paring and bottum up parsing	3	3	2	2										3
		4	Describe intermediate code representations using syntax trees and DAG's.	3	3	2	1										3
		5	Understand the use of procedural calls in intermediate code generation.	3	3	1	2										3
		6	Summarize various optimization techniques used for dataflow analysis and generate machine code from the source code of a novel language.	3	3	2	2										3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Computer Networks (BTCOC602)	1	Develop an understanding of modern network architectures , study protocols, network standards, the OSI model,TCP/IP model.				3									2	2
		2	Study different LAN,WI-FI and Wireless technologies.				3									2	2
		3	Study different error correcting and detecting codes.	3												2	3
		4	Study IP addressing scheme , routing algorithms ,ability to write program using socket programming.				3									2	3
		5	Study different application protocols.					3								2	2
		6	Ability to understand basic concepts of network security using cryptographic techniques.								3					2	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – V (A) Human Computer Interaction (BTCOE603)	1	Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.	1												3	
		2	Describe the key design principles for user interfaces.			2		3	3							3	
		3	Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems.			3	2		2							2	
		4	Develop and implement a process to gather requirements for, engage in iterative design of, and evaluate the usability of a user interface.				3	2	2							2	
		5	Demonstrate and knowledge of human computer interaction design concepts and related methodologies. with effective work design to real-world application.									2	2			2	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – V (B) Artificial Intelligence (BTCOE603)	1	Understand the notions of rational behavior and intelligent agents.			1										2	1
		2	Analyze and formalize the given problem as a state space search, design heuristics and select amongst different search or game based techniques to solve them.			3	3				3				1	2	1
		3	Develop intelligent algorithms for constraint satisfaction problems.			2	2									2	1
		4	Design intelligent systems for game playing in a competitive environment.			2	2									2	
		5	Attain the capability to represent various real life problem domains using logic based techniques and use this to perform reasoning and planning.	2							2					1	1
		6	Formulate and solve problems with uncertain information using Bayesian approaches.	2							2					1	1

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – V (C) Object-Oriented Analysis Design (BTCOE603)	1	To understand basic object oriented programming concepts like objects, classes, encapsulation,polymorphism and abstraction.	1										1		2	
		2	To understand various types of structural and behavioral diagrams and to draw them for real life applications.		3	2		2					2			1	
		3	To analyze problems using use cases and CRC card analysis methods.		2	1											
		4	To understand and distinguish various design patterns.		2		2									1	
		5	To implement various object oriented analysis and design concepts.		2	1								3		1	

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – VI (A) Geographic Information System (BTCOE604)	1	Understand basic concepts associated with GIS	1												2	2
		2	Understand apply and differentiate vector, raster and TIN		2											2	2
		3	Understand Digital Elevation Model (DEM), its resolutions and apply preprocessing techniques.		2	2										2	2
		4	Analyze Digital Elevation Model (DEM) and enhance its quality		2		2	2		1			2			1	2
		5	Application of GIS tools for identification of errors.	1	2		3	3		2			2			3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – VI (B) Biology (BTCOE604)	1	Outline the biological process, principles and applications				1										
		2	Classify the theories of origin of life, based on their types, structure and characteristics		1	1				1							
		3	Expand the information of living systems evolution and to consider the systems in relationship to the self and ecosystem function				1			1							
		4	Demonstrate the ability to describe and discuss the methods used to demonstrate the functions of the cell systems in the body						1	1							
		5	Know the basics of recombination in Prokaryotes cells						1	1							
		6	Interpret various aspects of Biological System, its principles and applications														

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Elective – VI (C) Internet of Things (BTCOE604)	1	Understand IoT architecture, applications, networking basics, and security aspects.		2				2		3					1	1
		2	Utilize hardware components and programming languages for IoT communication and protocols.	1	2	3		2								2	2
		3	Develop IoT applications with device integration, data acquisition, storage, and authentication.		2	3		2								2	2
		4	Analyze IoT case studies and implement mini projects in various domains.		2		3		2							1	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Open Elective – VII (A) Development Engineering (BTCOE605)	1	Demonstrate understanding of the principles of Development Engineering						1							1	2
		2	Understand the state of poverty in India via various human development indexes and understand the role of the engineer in sustainable development and engineering ethics.	1			2		2							1	2
		3	Analyze the social justice system for the parameters of human dignity, equal rights and social inclusion, along with environmental justice and be able to explain how social philosophies impact the appropriateness and sustainability of engineering solutions.	1			2			1						2	2
		4	Learn about implementation of development strategies via perspectives of social, technological, economic, health, education and business.			2		2		2		2				2	1
		5	Apply engineering knowledge and skills to a real-world humanitarian problem via participatory development through a technical design project, considering complex social factors and the unique needs of stakeholders and present the result in both verbal and written forms.	2		2	3			3			2			3	2
		6	Implement Modern tools of information technology, Machine Learning and block chain for Social Development.					1								3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Open Elective – VII (B) National Social Service (BTCOE605)	1	Understand the history, philosophy, aims & objectives of NSS, organizational structure, regular activities, special camping, and survey methodology.								3						
		2	Define youth, explore their profiles, categories, and their role as agents of social change; emphasize youth-adult partnership, community mobilization, and the importance of volunteerism.						2		3	3	1			1	
		3	Recognize the meaning and types of leadership, the qualities and traits of good leaders, and the significance of youth leadership.						2		2	2	1			1	
		4	Develop life competencies including communication, problem-solving, positive thinking, self-confidence, goal setting, stress, and time management.		2	3	2		2		3	1	3				
		5	Explore social harmony, national integration, and the role of youth in peace-building, conflict resolution, and nation-building.						2		3	3	2			1	
		6	Understand the National Youth Policy, youth development programs at national, state, and voluntary levels, and youth-focused/led organizations in India.								2	2					

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Open Elective – VII (C) Consumer Behaviour (BTCOE605)	1	Understand the scope, application ,importance and evolution of consumer behaviour														
		2	LEarn Market segmentation and understand the consumer decisionmaking process that leads to buying		1		1										
		3	Learn about models of consumer behavior		1		1										
		4	Be aware about the psychological and sociological influences on consumer decision making														
		5	Learn consumer behavior and maketing strategy		1		1										
		6	Understand multiplicative innovation model and Seth model of industrial buying				1										

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Competitive Programming-II (BTCOC606)	1	ApplyNumber theory Structures to solve programming problems		1	1											1
		2	Apply Backtracking to solve programming problems	1	2	2										1	2
		3	Apply Graph Traversals to solve programming problems		3	2	1	2								1	2
		4	Apply Graph Algorithms to solve programming problems		1	1	1									1	2
		5	Apply Dynamic Programming to solve programming problems	1	1	1	2									1	2
		6	Apply Grids to solve programming problems	1	2	2	2									1	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	(A) Mobile Application Development (BTCOL607A)	1	Develop a solid foundation in Swift programming, including data types, operators, control flow, and basic app development concepts.	1											2	2	
		2	Gain proficiency in UI Kit and its components, such as views, controls, and Auto Layout, to create responsive user interfaces for iOS apps.			2		3									2
		3	Acquire skills in navigating and structuring app workflows using navigation controllers, tab bar controllers, and segues, while effectively handling optionals and enumerations in Swift.		2	2											
		4	Implement data persistence techniques, image handling, and data sharing functionalities in iOS apps, utilizing scroll views, table views, and the user's photo library.				2										
		5	Apply advanced concepts like animations, concurrency, and web service integration to develop interactive and dynamic iOS apps, culminating in the successful completion of a self-designed app project.														

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	(B) Internet of Things Laboratory (BTCOL607B)	1	Develop server applications & corresponding client application for Arduino/Raspberry Pi by interfacing of various sensors having ability to upload/download sensor data transmitted wirelessly between different devices	2	3	3	2	2	2						2	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2019-20	Computer Networks Lab (BTCOL608)	1	Develop an understanding of modern network architectures , study protocols, network standards, the OSI model,TCP/IP model.				3	3								2	3
		2	Study different LAN,WI-FI and Wireless technologies.				3	3								2	3
		3	Study different error correcting and detecting codes.	3				3								2	3
		4	Study IP addressing scheme , routing algorithms ,ability to write program using socket programming.					3								2	3
		5	Study different application protocols.					3								2	3
		6	Ability to understand basic concepts of network security using cryptographic techniques.					3			3					2	3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2018-19

Doc No : BITACAD/CO-POMapping/COMP/Odd/2018-19

Session	**ODD SEMESTER**

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2018-19	Engineering Mathematics – III (BTBSC301)	**1**	Understand the concept of Laplace transform and inverse Laplace transform of elementary functions and apply it to solve the linear differential equations with constant coefficients having their applications in mechanical, electrical, chemical, communication etc. systems.	3	2											1	
		2	Apply the concept of Fourier transform to solve the boundary value problems, problems in signal processing and communication system.	2	2											2	
		3	Apply partial differential equations to solve heat equation, wave equation and Laplace equation etc.	3	2											1	
		4	Analyze conformal mapping, transformation and perform contour integration of complex function in the study of electromagnetics and signal processing.	3	2											2	

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2018-19	Discrete Mathematics (BTCOC302)	**1**	To understand the basic principles of sets and operations.	3											1	1	
		2	To demonstrate an understanding of relations and functions and to determine their properties.	3											1	1	
		3	To understand different methods in combinatorics.	2			2								1	2	
		4	To model problems in Computer Science using graphs.	2	2										1	2	
		5	To model problems in Computer Science using trees.	2	2										1	2	
		6	To understand various algebraic structures and their properties.	2											1	2	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Data Structures (BTCOC303)	1	To understand the basic terminologies of Data Structures	1	1												1
		2	To understand and apply Concept of sequential organization and hashing	2	3	3	2										2
		3	To understand, apply and evaluate various searching and sorting techniques.		2	2	1										2
		4	To design and implement various types of linked lists and its various applications		2	1											2
		5	To understand and implement stacks, queues data structures and their applications	2	3	3	2										2
		6	To implement concepts from trees and graphs to explore algorithms based on them.	2	3	3	2										2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Computer Architecture & Organization (BTCOC304)	1	To understand the basic hardware and software issues of computer organization			3										1	2
		2	Identify functional units,bus structure and addressing modes.		3										3	1	2
		3	Students will be able to identify where,when and how enhancements of computer performance can be accompolished.	3					3						3	1	2
		4	Identify memory hierarchy and performance.					3							3	1	2
		5	To understand control unit design.		3	3									3	1	2
		6	To understand input/output organization and pipelining			3									3	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Digital Electronics & Microprocessors (BTCOC305)	1	Understand digital signals, circuits, Boolean algebra, IC gates, binary arithmetic, and error detection codes.	2	3	3										2	
		2	Design logic functions using standard representation, K-maps, and implement multiplexers, decoders, adders, subtractors, and ALU.	2	3	3										2	
		3	Analyze and design sequential circuits, including flip-flops, shift registers, counters, and sequence generators.	2	3	3	2									2	3
		4	Comprehend microprocessor fundamentals, compare architectures (8085, 8086, 80386), and explain memory structures and timing diagrams.		3	3										2	
		5	Explain memory and I/O interfacing, DMA, and interrupts in 8086.		3	3										2	
		6	Utilize 8086 instruction set, addressing modes, and programming techniques to develop assembly and C language programs with programming tools.		3	3	3									2	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Basic Human Rights (BTHMC306)	1	Understand the history of human rights.								2	1	1		2	-	-
		2	Learn to respect others caste, religion, region and culture.								2	1	1		2	-	-
		3	Be aware of their rights as Indian citizen.								2	1	1		2	-	-
		4	Understand the importance of groups and communities in the society.								2	1	1		2	-	-
		5	Realize the philosophical and cultural basis and historical perspectives of human rights.								2	1	1		2	-	-
		6	Make them aware of their responsibilities towards the nation.								2	1	1		2	-	-

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Python Programming (BTCOL307)	1	Understand the concepts of programming and problem solving through python programming	3	3	2	3	3					2			3	3
		2	Implement the basic constructs of programming language like variables, loops, assignments, strings etc.	3	3	2	2	3					2			3	1
		3	Examine the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data.	3	2	2	3	3					2			3	1
		4	Interpret the concepts of Object-oriented programming as used in Python using encapsulation, polymorphism and inheritance.	3	3	3	2	3					2			3	1
		5	Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems.	2	1	2	1	3					2			3	3

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	HTML and JavaScript (BTCOL308)	1	To learn the concepts of web development process and project management by using various web technologies.	2		3						2		2		2	
		2	To learn evolution of markup languages and create hyperlinks,webforms,tables,frames,GUI in HTML.	2		2										2	
		3	To make use of web development tools for faster implementation of web projects.	2		2		2								1	
		4	Create tables, including strategies for inserting and styling tables, importing data into tables, and sorting data within tables in CSS.	2		2										1	
		5	Develop efficiency with basic javascript operators and number methods, including arithmetic operators, comparison operators,functions and trouble shooting.	2		2		3								1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Data Structures Lab (BTCOL309)	1	To understand the basic terminologies of Data Structures (4)	1	1												1
		2	To understand and apply Concept of sequential organization and hashing(2)	2	3	2	2										2
		3	To understand, apply and evaluate various searching and sorting techniques.(2)		2	1	1										2
		4	To design and implement various types of linked lists and its various applications(4)		1	1											2
		5	To understand and implement stacks, queues data structures and their applications(6)	2	3	2	2										2
		6	To implement concepts from trees and graphs to explore algorithms based on them.(2)	2	3	2	2										2

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Digital Electronics & Microprocessor Lab (BTCOL310)	1	Apply digital logic principles to design and implement Boolean expressions, arithmetic circuits, and code converters.	2	2	3	1									2	-
		2	Construct and analyze various types of adders, subtractors, and comparators using logic gates.	2	2	3	1									2	-
		3	Implement led display drivers using decoder chips and understand the use of priority encoders.	2	2	3	1									2	-
		4	Verify the truth tables of various flip-flops and implement sequential circuits, including counters and sequence generators.	2	2	3	1									2	-
		5	Design and implement finite state machines (FSM) in both Moore and Mealy machine configurations.	2	2	3	1	-	-	-	-	-	-	-	-	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Field Training / Internship /Industrial Training Evaluation (BTCOF311)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3

Shiksha Mandal's

Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Computer Engineering)

Session 2018-19

Doc No : BITACAD/CO-POMapping/COMP/Even/2018-19

Session	**EVEN SEMESTER**

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2018-19	Design & Analysis of Algorithms (BTCOC401)	**1**	Analyzing the time complexity of a given algorithm and data structure operations.	2													1
		2	Analyze and Design algorithms using divide and conquer approach.		1	3	2									1	2
		3	Analyze and Design algorithms using a greedy approach.		1	3	2									2	2
		4	Analyze and Design algorithms using dynamic programming		1	3	2									1	2
		5	Analyze and Design algorithms using backtracking and branch and bound techniques.		1	3	2									1	2
		6	To distinguish between P and NP classes of problems.	1			2									1	2

	Course/Subject with course code	**Course Outcomes (COs)**		**Program Outcomes (POs)**												**PSOs**	
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
2018-19	Probability & Statistics (BTCOC402)	**1**	apply Baye's theorem, basic probability axioms and rules to solve the problems, also they apply problem-solving techniques to solving real-world events.	1	3		2									2	
		2	calculate probabilities; derive the marginal and conditional distributions of bivariate random variables.	1	3		2									2	
		3	apply selected probability distributions (binomial, Poisson and normal) to solve problems.	1	3		2									1	
		4	calculate the correlation between two variables and simple linear regression equation for the set of data, also they apply the principles of linear regression and correlation (including least square method) and predict the particular value of Y for given value of X and significance the correlation coefficient.		2											2	
		5	perform the test of significance and calculate difference of proportions, single mean, difference of means, and difference of standard deviations.		3											1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Operating Systems (BTCOC403)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3		3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3		3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system							3			3		3	2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system				2						3		3	2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3		3	1	
		6	Explain concept File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3		3	1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Elective - I (B) Object Oriented Programming in C++ (BTCOE404B)	1	Understand the principles and benefits of object-oriented programming and the object-oriented approach.	1				1		2	1	1				2	2
		2	Apply object-oriented concepts to create classes, objects, and constructors, and work with objects as data types.				1			2	2	1				2	2
		3	Implement operator overloading, inheritance, and multiple inheritance in object-oriented programming.				1			2						2	2
		4	Utilize polymorphism through virtual functions, abstract classes, and pure virtual functions.				1	1			2					2	2
		5	Work with streams, files, and stream manipulators for input/output operations and file handling.				2	1		2	1	1			2	2	2
		6	Utilize templates and exception handling mechanisms for code reusability and error management.	1			1			3	1				1	2	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Elective - I (B) Object Oriented Programming in Java (BTCOE404)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects and Introduction to Java and Java Development Environment.	1												3	2
		2	Understand and apply concepts of Classes, Objects, Methods and Strings	1				1								3	2
		3	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.		1	1		1								3	2
		4	Understand and build applications using Arrays.		1	1		1								3	2
		5	Analyze types of constructors, composition and garbage collection technics	2	2	2		3							2	3	2
		6	Design and build applications using Inheritance and Polymorphism.		2	2		2							1	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Product Design Engineering (BTXXC406)	1	Describe an engineering design and development process		3			3							1	3	2
		2	Work collaboratively on a team to successfully complete a software project	1	2	3					2	3		1	1	3	2
		3	Gather the requirements from the customers and establish technical software requirement specification		3		3						2		1	3	2
		4	Apply creative process techniques in synthesizing the solution, problem-solving and critical thinking	1	3	3	3								1	3	2
		5	Experience SDLC, innovation and research, prototyping, patenting and research publication.		1	1		3					3	3	1	3	2

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Elective - II A Numerical Methods (BTCOE405)	1	CO1: Apply various methods (Bisection, False Position, Newton's method, Newton-Raphson method) to solve algebraic and transcendental equations.	3	2	2	2								3	1	1
		2	CO2: Solve linear simultaneous equations using Gauss elimination, Gauss-Jordan, Jacobi iteration, Gauss-Seidal iteration, and Relaxation methods.	3	2	2	2								3	1	1
		3	CO3: Utilize finite difference operators and interpolation formulas (Forward difference, Backward difference, Central difference, Newton's interpolation) for solving problems.	3	2	2	2								3	1	1
		4	CO4: Apply numerical techniques (Newton-Cortes formula, Trapezoidal rule, Simpson's rules) for differentiation and integration.	3	2	2	2								3	1	1
		5	CO5: Implement numerical methods (Picard's methods, Taylor series, Euler's method, Modified Euler's method, Runge-Kutta method) for solving ordinary differential equations.	3	2	2	2								3	1	1

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Elective - II B Physics of Engineering Materials (BTCOE405)	1	Understand magnetic materials and their properties, including ferromagnetism and hysteresis.	3	3	2	2										-
		2	Comprehend superconductivity and its applications.	2	2	3	3	1								1	-
		3	Understand semiconducting materials and their applications, including LEDs and photovoltaic cells.			1	1	1	2								-
		4	Gain knowledge about dielectric materials and their applications, including ferroelectric and piezoelectric materials.					2	2	3	3					1	-
		5	Explore nanomaterials, their synthesis, properties, and applications.									2	2			1	-

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Elective - II C Soft skills and Personality Development (BTCOE405)	1	Acquire interpersonal communication skills								1					-	-
		2	Develop the ability to work independently.										2			-	-
		3	Develop the qualities like self-discipline, self-criticism and self-management.												2	-	-
		4	Have the qualities of time management and discipline									1				-	-
		5	Present themselves as an inspiration for others										2			-	-
		6	Develop themselves as good team leaders											3		-	-

	Course/Subject with course code		Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
		1	Analyzing the time complexity of a given algorithm and data structure operations.	1												1	

2018-19	Design & Analysis of Algorithms Lab (BTCOL407)	2	Analyze and Design algorithms using divide and conquer approach.			2	1									2	2
		3	Analyze and Design algorithms using a greedy approach.			2	1									2	2
		4	Analyze and Design algorithms using dynamic programming			3	2									2	2
		5	Analyze and Design algorithms using backtracking and branch and bound techniques.			3	2									2	2

	Course/Subject	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
	with course code			1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Introduction to Data Science with R (BTCOL408)	1	Introduction to basic data types in R	1												1	
		2	Apply R paradigm to work with vectors and matrices			2	1									2	2
		3	Apply R paradigm to work with fractors and data frames			2	1									2	2
		4	Apply R paradigm to work with lists			3	2									2	2
		5	Using R's packages graphics and data visualizations			3	2									2	2

	Course/Subject	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
	with course code			1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Object Oriented Programming Lab (BTCOL409)	1	Understand the principles of object-oriented concepts, create classes, instantiate objects and Introduction to Java and Java Development Environment. (2)	1												3	3
		2	Understand and apply concepts of Classes, Objects, Methods and Strings (4)	1		1		1								3	3
		3	Understand, analyze, and apply control statements in Java. Demonstrate the use of library methods.(4)		1	1		1								3	3
		4	Understand and build applications using Arrays.(2)		2	2	1	2								3	3
		5	Analyze types of constructors, composition and garbage collection technics(4)	2	3	3		3							2	3	3
		6	Design and build applications using Inheritance and Polymorphism.(4)		2	2		2							1	3	3

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Operating System Lab (BTCOL410)	1	Define operating system, compare objectives and functions of modern operating systems, types of operating system and services , system design and implementation							3			3		3	3	
		2	Explain and compare various the CPU scheduling methods and goals of scheduling in operating system							3			3		3	2	
		3	Explain the process synchronization ,choose appropriate solution to solve problems of the process synchronization in operating system							3			3		3	2	
		4	Interpret the concept of deadlocks in operating system, list the prevention ,detection & avoidance steps of deadlock and security steps in operating system				2						3		3	2	
		5	Outline memory management in operating system ,categorize its methods and basic knowledge of paging, segmentation and thrashing concepts				2						3		3	1	
		6	Explain concept of File systems used in operating system, classify the access methods and disk arm scheduling strategies				2						3		3	1	

	Course/Subject with course code	Course Outcomes (COs)		Program Outcomes (POs)												PSOs	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
2018-19	Field Training / Internship / Industrial Training Evaluation (BTCOF411)	1	To provide industrial exposure to student to experience the real world problems through short industry projects		1	1			2		1			3	3	3	3
		2	To enable the students to become aware of industrial culture, organizational setup, and collaborations		1	1			2		1	3		3	3	3	3
		3	To identify gap in existing knowledge to help develop a specialization		1	1			2		1			3	3	3	3
		4	To create awareness about technical report writing among the student.		1	1			2		1		3	3	3	3	3