Sr No	Semester	Subject Code	Name of the Subject	CO	Course Outcomes
1	III	BTBS301	Engineering Mathematics – III	CO1	Solve engineering problems using the principles of solution of differential equations.
				CO2	Understand analytic function of a complex variable and able to apply Cauchy integral theorem and residue theorem to solve contour integrations
				CO3	Use Fourier transforms and its inverse in practical applications of electronics engineering.
				CO4	Apply Laplace transform and its inverse to solve initial value and other related problems.
				CO5	Know basic statistical techniques required for electronics engineering
				CO6	To UnderStand Functions of Complex Variables (Integral calculus)
2	III	BTCOC302	Discrete Mathematics	CO1	To introduce the concepts of propositional logic & mathematical logic.
				CO2	To perform the operations associated with sets, functions, and relations.
				CO3	To introduce generating functions and recurrence relations.
				CO4	To study Graph terminologies, Euler's path and Hamiltonian circuit; graph representation and apply Dijkstra's algorithm to find shortest path.
				CO5	To develop an understanding of how graph and tree concepts are used to solve problems like Prim's and Kruskal's algorithm.
				CO6	Analyse basic facts of algebraic structures.
3	III	BTCOC303	Data Structures	CO1	Students should be able to know the fundamentals of data structures like array, list, linked list, stack, queue, tree, graph, hashing.
				CO2	Apply Stack, Queue Linear data structure to solve problems
				CO3	Apply Linked list data structure for solving problems

				CO4	Analyze nonlinear data structure.
				CO5	Use appropriate searching and sorting technique for better efficiency
4	**III**	**BTCOC304**	**Computer Architecture & Organization**	**CO1**	To draw and explain the internal architecture of 8086 with its register organisation.
				CO2	Explain various arithmetic and logical 8086 instructions and assembler directives.
				CO3	Explain single bus architecture within the processor with complete execution cycle.
				CO4	Explain various types of memories and solve numerical on cache memory design.
				CO5	Explain and solve arithmetic operations like multiplication using booths algorithm and bit pairing method.
				CO6	Perform various arithmetic operations in the 2"s complement system.
5	**III**	**BTCOC305 Elective-I**	**Object Oriented Programming in C++**	**CO1**	Introduces Object Oriented Programming concepts using the C++ language
				CO2	Understanding the principles of data abstraction, inheritance and polymorphism
				CO3	Able to develop programs with reusability.
				CO4	Apply the principles of virtual functions and polymorphism.
				CO5	Analyzing the handling formatted I/O and unformatted.
				CO6	Develop programs for file handling.
				CO7	Handle exceptions in programming.
				CO8	Analyse and Apply the generic classes concepts in programming problem
				CO9	Develop applications for a range of problems using object-oriented programming techniques.
6	**III**	**BTCOL306**	**Data Structure Lab**	**CO1**	Evaluate Array, Stack, Queue & Linked List of linear data structure.

				CO2	Evaluate nonlinear data structure.
				CO3	Evaluate Tree traversals
				CO4	Evaluate searching and sorting techniques.
			Object Oriented Programming Lab	**CO1**	Creating simple programs using classes and objects in C++.
				CO2	Implement object oriented programming concepts using class and objects
				CO3	Design and assess the classes for code reuse
				CO4	Analyse and Apply the generic classes concepts in programming problem
				CO5	Illustrate and evaluate the file Input Output mechanisms
				CO6	Implement Object Oriented Programs using templates and exceptional handling concepts.
7	**III**	**BTCOS307**	**Seminar-I**	**CO1**	To establish motivation for any topic of interest and develop a thought process for technical presentation.
				CO2	To organize a detailed literature survey and build a document with respect to technical publications.
				CO3	To analysis and comprehension of proof-of-concept and related data.
				CO4	To give effective presentation and improve soft skills
				CO5	To Make use of new and recent technology (e.g. Latex) for creating technical reports.
	IV	**BTCOC401**	**Design and Analysis of Algorithms**	**CO1**	Given an algorithm, identify the problem it solves.
				CO2	Understand the basic notation for analysing the performance of the algorithms.

8				**CO3**	Write algorithms choosing the best one or a combination of two or more of the algorithm design techniques: Iterative, divide-n-conquer, Greedy, Dynamic Programming using appropriate data structures.
				CO4	Use a backtracking approach to solve an appropriate problem.
				CO5	Use a greedy approach to solve an appropriate problem for optimal solution.
				CO6	Apply a dynamic programming approach to solve suitable problems.
9	**IV**	**BTCOC402**	**Operating System**	**CO1**	Understands the different services provided by Operating System at different level.
				CO2	Understands the use of different process scheduling algorithm and synchronization techniques
				CO3	Understand deadlock, prevention and avoidance algorithms.
				CO4	Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms.
				CO5	To be familiar with the basics of Linux system and Mobile OS like iOS and Android
				CO6	Understand the concept of files and inodes.
10	**IV**	**BTCOC403**	**Basic Human rights**	**CO1**	Understand the basic concept of human right,human duties ,right of working and independance
				CO2	Understand the social structure and economic problem
				CO3	Study the human right violation ,migrant worker , NGO ,Nature conservation laws.
				CO4	Understanding of the Human rights in Indian constitution and law and some othr provisions under the Constitution of India dealing with human rights.
				CO5	Understanding human right declaration and also study the national state human right commission.
11	**IV**	**BTCOC404**	**Probability Theory and Random Processes**	**CO1**	Identify and explain one and two dimensional random variables along with their distributions and statistical averages

				CO2	Explain the basic concepts of probability, conditional probability and Bayes' theorem
				CO3	Apply some probability distributions to various discrete and continuous problems.
				CO4	Solve the problems related to the component and system reliabilities
				CO5	Identify the random processes and compute their averages.
				CO6	Solve the problems on Ergodic process, Poisson process and Markov chain
12	**IV**	**BTCOC405**	**Digital Logic Design & Microprocessors**	**CO1**	To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems. To study the basic philosophy underlying the various number systems representation.
				CO2	To implement simple logical operations using combinational logic circuits.
				CO3	To implement simple logical operations using sequential logic circuits. To study various flip-flops.
				CO4	Introduction and brief history of Microprocessors. Architecture of 8086 Microprocessor, Instruction Set of 8086, Working registers, Memory Structures.
				CO5	8086 Instruction Set and Programming, various addressing modes of 8086. To study Assembly language programs, C language programs.
13	**IV**	**BTCOL406**	**Operating System Lab**	**CO1**	Study of Shell Script programming using the commands grep, awk, and sed.
				CO2	Implementation of command interpreter
				CO3	Write a program to implement the concept of threading.
				CO4	Write a program to implement CPU Scheduling algorithms Demonstrate the working of CPU Scheduling algorithms (any two). a. FCFS b. SJF (Preemptive & non-preemptive) c. Round Robin.

				CO5	Write a program to implement Memory Management algorithms – best fit, first fit, worst fit Demonstrate the working of Memory Management algorithms (any two). a. First Fit b. Best Fit c. Worst Fit
				CO6	Write a program to implement Page Replacement algorithms Demonstrate the working of Page Replacement algorithms (any two). a. FIFO(First In First Out) b. LRU(Least Recently Used) c. Optimal
				CO7	Write a program for Banker's algorithm
				CO8	Write a program to demonstrate disk scheduling algorithms Demonstrate the working of the Disk Scheduling algorithms (any two). a. FCFS b. SSTF c. SCAN d. C-SCAN
		BTCOL406	**Python Programming Lab**	**CO1**	Design an algorithm for a given problem statement.
				CO2	Construct a data structure appropriate for given algorithmic solution.
				CO3	Write, debug and execute Python code using Python interpreter and/or any IDE.
				CO4	Solve a given computational problem using Python programming language.
				CO5	Use the concepts of classes and functions to modularize problem solution.
				CO6	Create, Organize and Access data in the form of file structures.
14	**IV**	**BTCOS407**	**Seminar-II**	**CO1**	To understand the overview of Web Design Concepts, Web Site Usability and Accessibility, multimedia.
				CO2	To study HTML and the Evolution of Markup languages, Create Hyperlinks, Create Tables, Create Web Forms, Image Inserting Techniques, Create Frames.
				CO3	To understand features of Dreamweaver Interface, Setting Up a Site with Dreamweaver. To create various types of Links, Insert multimedia including text, image, animation & video.

				CO4	To study Cascading Style Sheets for Web page design, format Text with CSS, Embed Style Sheets, and Attach External Style Sheets, Style Tables with CSS.
				CO5	To study JavaScript, Storing the information you need using Variables, Basic in JavaScript — Numbers and operators, Useful string methods, Arrays, Making decisions in your code using Conditionals, Looping code.
15	**V**	**BTCOC501**	**Database System**	**CO1**	Understand the basic concepts and the applications of database systems, ER Diagramming.
				CO2	Understanding structure of Relational Database, Relational Algebra queries.
				CO3	Write SQL Queries DDL, DML to create databases and manipulate records.
				CO4	Database Design JOINS, Advanced SQL, Understanding Triggers.
				CO5	Database Design JOINS, Advanced SQL, Understanding Triggers.
				CO6	Understanding basics of transaction processing and concurrency control.
16	**V**	**BTCOC502**	**Theory Of Computation**	**CO1**	Understand the basic concept and interpret the mathematical foundations of computation including automata theory
				CO2	Understand the basic properties of formal languages and grammars.
				CO3	Construct the abstract machines including finite automata, pushdown automata, and Turing machines from their associated languages and grammar
				CO4	Make use of pumping lemma to show that a language is not regular / not context-free.
				CO5	Construct the grammar for any given finite automata, pushdown automata or Turing machines.
				CO6	Outline the characteristics of P, NP and NP Complete problems .

17	**V**	**BTCOC503**	**Software Engineering**	**CO1**	Understand some ethical and professional issues that are important for software engineers.
				CO2	Analyse a system for managing records of patients undergoing treatment for mental health problems, a control system for a portable insulin pump and a wilderness weather system.
				CO3	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
				CO4	Implement generic software process models and agile development methods.
				CO5	Understand how graphical models can be used to represent software systems using UML.
				CO6	Systematically plan and estimate software system using standard estimation models.
				CO7	Perform software validation by understanding the stages of testing from development to acceptance testing by system customers
				CO8	Have learned about different types of software maintenance and the factors that affect maintenance costs.
18	**V**	**BTCOE504 Elective-II**	**Numerical Methods**	**CO1**	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
				CO2	Apply numerical methods to obtain approximate solutions to mathematical problems.
				CO3	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
				CO4	Analyse and solve several errors and approximation in numerical methods.
				CO5	Apply several methods to solve Curve Fitting and Interpolation questions and its related techniques

19	**V**	**BTHM505 Elective-III**	**Economics and Management**	**CO1**	To study workings of the market - demand and supply, market and adjustments, market sensitivity, Elasticity concepts and cost management system.
				CO2	To understand economics and management concept which often emphasize on critical thinking and problem-solving skills. Also to study budget concepts.
				CO3	To understand and interpret financial statements, which are essential tools for assessing a company's financial health and performance. The time value of money (TVM) is a fundamental financial concept that reflects the idea that a sum of money today is worth more than the same sum of money in the future.
				CO4	To explain and apply various depreciation methods, such as straight-line depreciation, declining balance depreciation, and units-of-production depreciation. To study functions of management like planning, organizing, leading (or directing), and controlling.
				CO5	To gain a comprehensive understanding of the product development process, from concept generation to market launch, including the various stages involved. To gain a fundamental understanding of the principles and concepts related to plant layout, including factors that influence layout decisions such as product design, process flow, equipment selection, and safety regulations.
20	**V**	**BTCOL506**	**Software Engineering Lab**	**CO1**	Discuss and analyse how to develop software requirements specifications for a given problem.
				CO2	Analyse and draw Data Flow Diagram models.
				CO3	Understand and describe basic concept of UML modelling.
				CO4	Understand and develop various structural and behavioural UML diagrams.
				CO5	Generate test cases and perform software testing.
				CO6	Understand and implement various perspectives of software design.
				CO1	Understand the basic concepts and the applications of database systems, ER Diagramming.

			Database System Lab	**CO2**	Develop a database with various constraints using SQL Data Definition Language.
				CO3	Use DML queries to retrieve, insert, delete and update the database
				CO4	Apply various SQL features such as Aggregate functions, Set Operations and Views to resolve the queries.
				CO5	Demonstrate Stored Procedure, Stored function and Trigger on a Sample Databases.
				CO6	Develop database application using ODBC/JDBC interface to store and retrieve data from the database.
21	**V**	**BTCOM507**	**Mini Project -I**	**CO1**	Demonstrate the ability to identify and analyze a real-world problem or challenge and propose a solution
				CO2	Develop research skills by conducting a literature review, gathering data, and synthesizing information from various sources.
				CO3	Acquire or enhance technical skills and knowledge related to the project's subject matter or tools and technologies required for implementation
				CO4	Conduct an engineering project.
				CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer
22	**VI**	**BTCOC601**	**Complier Design**	**CO1**	To realize the basics of compiler design and apply it to real-time applications.
				CO2	To introduce different translation languages.
				CO3	To understand the importance of code optimization.
				CO4	To know about compiler generation tools and techniques.
				CO5	To learn the workings of compiler and non-compiler applications.
				CO6	Design a compiler for a simple programming language.

23	**VI**	**BTCOC602**	**Computer Networks**	**CO1**	Define the fundamental concepts and applications of Computer Networks.
				CO2	Demonstrate the working of layers in ISO-OSI and TCP/IP Network Models.
				CO3	Determine the Network Performance.
				CO4	Evaluate different types of Wired and Wireless Technologies.
				CO5	Analyse and Apply the Error Handling approaches in Data Communication.
				CO6	Exhibit the functioning of Network Protocols.
				CO7	Explore techniques to handle Congestion in the Computer Network.
				CO8	Examine and Employ various methods to achieve Network Security.
24	**VI**	**BTCOC603**	**Machine Learning**	**CO1**	Learn the basics of learning problems with hypothesis spaces and bias
				CO2	Understand the features of machine learning to apply on real world problems
				CO3	Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyse the various algorithms of supervised and unsupervised learning
				CO4	Learn the concepts in Bayesian analysis from probability models and methods.
				CO5	Analyze the concept of neural networks for learning linear and non-linear activation functions
25	**VI**	**BTCOE604** **Elective-IV**	**Internet of Things**	**CO1**	Interpret the impact and challenges posed by IoT networks leading to new technologies and architectural models.
				CO2	Illustrate the smart objects and the technologies to connect them to network.

				CO3	Compare different Application protocols for IoT.
				CO4	Infer the role of Data Analytics and Security in IoT.
				CO5	Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.
				CO6	Understand the physical devices like sensors, actuators and controllers and use them to build IoT applications.
26	**VI**	**BTHM605 Elective- V**	**Consumer Behaviour**	**CO1**	To study consumer behaviour and it's evolution. Also, to study interdisciplinary nature and various approaches to consumer behaviour research.
				CO2	To explain the process of consumer decision-making, including problem recognition, information search, evaluation of alternatives, purchase, and post-purchase evaluation. To study the market segmentation, targeting and positioning.
				CO3	To study various models of consumer behaviour.
				CO4	To study the psychological factors that influence consumer behaviour, such as motivation, perception, attitude formation, and learning. Understand the impact of social and cultural factors, including family, reference groups, social class, culture, and subculture, on consumer choices. Develop effective communication skills for presenting research findings and consumer behaviour insights.
				CO5	To explain the characteristics and behaviours of innovators and early adopters, and understand their role in driving the early stages of diffusion. To explain Organization Buyer's Decision-Making Process. To study product, price, distribution and promotion strategy related to consumer behaviour.
27	**VI**	**BTCOL606**	**Competitive Programming Lab**	**CO1**	Learn the basics of learning problems with hypothesis spaces and bias
				CO2	Understand the problem statements. analyse, find a solution. recognize the time and memory complexity of an algorithm
				CO3	Understanding the concepts, study algorithms.
				CO4	Learning technics and strategies to solve a problem statement and apply the knowledge on a wider set of problems.

				CO5	Participate in the programming challenges in competitive platforms like codechef.com, uva.onlinejudge.com
				CO6	Practice the challenging problems to succeed in the programming challenges.
			Machine learning Lab	**CO1**	Understand the mathematical and statistical prospective of machine learning algorithms through R programming and python programming.
				CO2	Design and evaluate the unsupervised models through R in built functions.
				CO3	Design and evaluate the supervised models through R in built functions.
				CO4	Design and develop the code for House Price Data through python programming
28	**VI**	**BTCOM607**	**Mini Project-II**	**CO1**	Demonstrate the ability to identify and analyze a real-world problem or challenge and propose a solution
				CO2	Develop research skills by conducting a literature review, gathering data, and synthesizing information from various sources.
				CO3	Acquire or enhance technical skills and knowledge related to the project's subject matter or tools and technologies required for implementation
				CO4	Conduct an engineering project.
				CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer
29	**VII**	**BTCOC701**	**Artificial Intelligence**	**CO1**	Demonstrate a fundamental understanding of the history of artificial intelligence (AI) and its foundations.
				CO2	Apply basic principles of AI in solutions that require problem-solving, inference, perception, knowledge representation, and learning.
				CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and natural language processing.

				CO4	Apply AI techniques to real-world problems to develop intelligent systems.
				CO5	Understand the informed and uninformed problem types and apply search strategies to solve them.
				CO6	Apply difficult real-life problems in a state space representation so as to solve those using AI techniques like searching and game playing.
30	**VII**	**BTCOC702**	**Cloud Computing**	**CO1**	Understand various basic concepts related to cloud computing technologies.
				CO2	To demonstrate an understanding of Service models, deployment models, Virtualization.
				CO3	Understand different cloud programming platforms and tools.
				CO4	Create application by utilizing cloud platforms such as Google app Engine and Amazon Web Services (AWS)
				CO5	Be familiar with cloud programming using Google's 'Go' programming language.
31	**VII**	**BTCOE704 Elective -VI**	**Block Chain Technology**	**CO1**	Describe the fundamental concepts of Blockchain Technology and Cryptocurrency.
				CO2	Identify the Cryptographic concepts required to implement Blockchain applications.
				CO3	Define the notions related with Bitcoin Cryptocurrency.
				CO4	Evaluate the Consensus methods used in Bitcoin/Permission-less Blockchain System.
				CO5	Examine and apply Consensus algorithms in Permissioned Blockchain System.
				CO6	Explore different real-time applications of Blockchain system.
				CO7	Implement Smart Contract based system with Ethereum/Hyperledger.
32	**VII**	**BTCOE703C**	**Big Data Analytics**	**CO1**	Understand Big Data and its analytics in the real world.

		Elective -VI		**CO2**	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.
				CO3	Design of Algorithms to solve Data-Intensive Problems using Map Reduce Paradigm.
				CO4	Design and Implementation of Big Data Analytics using Pig and Spark to solve data-intensive problems and to generate analytics.
				CO5	Implement Big Data Activities using Hive.
33	**VII**	**BTCOE705**	**Deep learning**	**CO1**	Understand the history of deep learning and see the success story.
				CO2	Study the models are McCulloch Pitts Neuron,perceptron, MLP ,Sigmoid Neurons, Gradient Descent.
				CO3	Implement deep learning algorithm and solve real -world problem
				CO4	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
				CO5	Design of another class of layered networks using deep learning principles.
34	**VII**	**BTCOL707**	**Cloud Computing Lab**	**CO1**	Sketch out and analyze architecture of Moodle cloud portal and moodle cloud site and create different entities dynamically.
				CO2	Create a scenario in wordpress for Social Marketing, Search engine and Sharing Tools.
				CO3	Working in Codenvy to demonstrate Provisioning and Scaling of a website.
				CO4	Implement and configure Google App Engine to deploy Python Program application.
				CO5	Installation and configuration of virtual machine with guest OS.
				CO6	Categorize Amazon Web Service (AWS) and implement its various cloud entities using its Cloud Toolbox support.
			Artificial Intelligence Lab	**CO1**	Write PROLOG code using PROLOG environment and make Inferences.

				CO2	Develop a solution based on Backtracking technique.
				CO3	Evaluate and Apply different types of Graph Traversal algorithms.
				CO4	Construct a solution using Recursive Control Search technique for problem solving.
				CO5	Implement the solutions for real-world problems using PROLOG.
35	**VII**	**BTCOS708**	**Project Phase-I**	**CO1**	Demonstrate a sound technical knowledge of their selected project topic.
				CO2	Undertake problem identification, formulation and solution
				C03	Design engineering solutions to complex problems utilizing a systems approach.
				CO4	Implement an engineering project
				CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer.
36	**VIII**	**BTCOF801**	**Project Phase-II**	**CO1**	Demonstrate a sound technical knowledge of their selected project topic.
				CO2	Undertake problem identification, formulation and solution
				C03	Design engineering solutions to complex problems utilizing a systems approach.
				CO4	Implement an engineering project
				CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer.