

B.Tech (Computer Science and Engineering)	
1st SEMESTER	
Course Name: Semiconductor Physics (BTPH104-18)	
At the end of the course, the student will be able to:	
CO1	Apply the fundamental principles to study the properties of electronic materials
CO2	Outline the free electron theory and periodic potential for electronic material
CO3	Identify the properties and Behaviors of semiconductor
CO4	Explain the Principle of optoelectronics devices and its applications
CO5	Apply the fundamental principles to study the properties of electronic materials
Course Name: Semiconductor Physics Lab (BTPH114-18)	
CO1	Identify the physical principle involved in the various instruments.
CO2	Verify some of the theoretical concepts learnt in the theory courses.
CO3	Draw conclusions from data and develop skills in experimental design.
CO4	Summarize technical report which communicates scientific information in a clear and concise manner.
CO5	Demonstrate to the methods used for estimating and dealing with experimental uncertainties and systematic "errors."
Course Name: Maths -1 (BTPH104-18)	
CO1	Apply differential calculus for single variable functions.
CO2	Apply integral calculus for single variable functions and its applications.
CO3	Find the rank and inverse of matrices by elementary transformations.
CO4	Illustrate the concept of vector spaces & linear transformations of finite dimensional vector spaces.
CO5	Make use of matrices and linear algebra.
Course Name: Basic Electrical engineering (BTEE 101-18)	
CO1	Outline the basic concept of DC and AC Electrical circuits
CO2	Apply the fundamental principles of DC & AC electrical circuits to solve the problems related to electrical circuits
CO3	Interpret the physical components and working of transformer.
CO4	Demonstrate the working and constructional details of DC machines and Induction Motors.
CO5	Summarize the different electrical components ,wiring and earthing for electrical installations.
Course Name: Basic Electrical engineering Lab (BTEE 102-18)	
CO1	Identify the physical principle involved in the various instruments.
CO2	Verify some of the theoretical concepts learnt in the theory courses.
CO3	Draw conclusions from data and develop skills in experimental design.
CO4	Summarize technical report which communicates scientific information in a clear and concise manner.
CO5	Demonstrate to the methods used for estimating and dealing with experimental uncertainties and systematic "errors."

Course Name: Engineering Graphics & Design (BTME 101-21)	
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CO1	Describe the principles of Engineering Graphics and its tools.
CO2	Draw orthographic projection and explain its concept.
CO3	To have the knowledge of generating the pictorial views.
CO4	Explain the solid projection techniques and surface development.
CO5	Use CAD Tools to draw 2d and 3D Models and generate printable drawing.

2nd SEMESTER	
Course Name: Chemistry-1 (BTCH101-18)	
CO1	State the periodic functions, theories and solutions of Quantum mechanics.
CO2	Explain spectroscopic techniques and behavior of metallurgical systems.
CO3	Explain the principles of intermolecular interactions and geometrical features of stereochemistry.
CO4	State the organic reactions, basic principles and the processes of thermodynamic system.
CO5	Illustrate the properties of water corrosion and its remedial effects.
Course Name: Chemistry-1 Lab (BTCH102-18)	
CO1	Synthesize a small drug molecule and analyse a salt sample
CO2	Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water
CO3	Analyze the acid content of different lubricating oils used in daily life.
CO4	Acquire some technical, theoretical as well as a practical knowledge for introduction to principles and techniques of chromatography
CO5	Study the arrangement of atoms in different structures.
Course Name: Maths -II (BTAM204-18)	
CO1	Recall the various measures of Statistics like arithmetic mean, median and mode, moments, skewness and kurtosis.
CO2	Relate two variables and fit the curves for prediction using data
CO3	Apply probability distributions and their properties.
CO4	Develop probabilistic models for continuous distributions.
CO5	Interpret the sample data for given population.
Course Name: Programming for Problem Solving (BTPS 101-18)	
CO1	Explain the basics of computer hardware and software, algorithm, pseudo codes and programming structures.
CO2	Illustrate the use syntax, semantics and constructs to solve mathematical and logical problems in 'C' language.
CO3	Identify the role of simple data structures, memory allocation and data handling for various applications in 'C'.
CO4	Identify the concept of functions.
CO5	Make use of structures, pointers and file handling to perform various file related operations.
Course Name: Programming for Problem Solving Lab (BTPS 102-18)	
CO1	Determine the algorithms for simple problems using arithmetic expressions.
CO2	Outline problems involving if-then-else structures.
CO3	Devise iterative as well as recursive programs.
CO4	Interpret data in arrays, strings and structures and manipulate them.
CO5	Review the pointers of different types and use them in defining self-referential structures.
Course Name: Workshop/ Manufacturing Practices (BTMP 101-18)	

CO1	Define different manufacturing processes employed in workshop.
CO2	Demonstrate the various process parameters.
CO3	Compare theoretical and practical aspects of the dimensional accuracies and tolerances of different manufacturing processes
CO4	Illustrate the knowledge of different job shops.
CO5	Define the advance manufacturing practices.
Course Name: English (BTHU 101-18)	
CO1	Construct sentences using different forms of a word and illustrate significance of using formal & in-formal words in different context.
CO2	Identify the importance of using formal grammar (such as rules, proper order of words and sequence of sentences) and spot grammatical errors.
CO3	Classify different types of sentence structures (such as simple, compound and complex sentences) and remember usage of it in different contexts.
CO4	Summarize factual information from a text and then paraphrase it using techniques of writing precisely.
CO5	Organize formal writings (business, report, proposal, E-mail, writings) and informal writings such as personal letter & e-mails etc. using a specified format.
Course Name: English Lab (BTHU 102-18)	
CO1	Comprehend spoken English (such as pronunciation of weak forms and contractions, via listening to audio-video aids) and summarize it.
CO2	Identify difference between formal & informal ways (use of body language, gestures, verbal and facial expressions) of holding discussions in a group.
CO3	Illustrate different functions of English Language and make use of them to handle daily routine conversation and dialogues.
CO4	Apply grammatically error free interrogative and affirmative statements while facing interviews.
CO5	Utilize formal & informal vocabulary (such as idioms and phrases) to give presentations.

3rd SEMESTER	
Course Name: Digital Electronics (BTES301-18)	
CO1	Demonstrate the operation of simple digital gates, identify the symbols, develop the truth table for those gates; combine simple gates into more complex circuits.
CO2	Show Conversion of binary, hexadecimal, octal numbers to their decimal equivalent and vice versa, Apply concepts of Boolean algebra for handling logical expressions.
CO3	Demonstrate working and realization of Combinational Circuits.
CO4	Explain the operation of a flip-flop. Design counters and clear the concept of shift registers
CO5	Illustrate different types of memories and their applications. Convert digital signal into analog and vice versa.
Course Name: Data structure & Algorithms (BTCS 301-18)	
CO1	Explain the performance of data structure operations.
CO2	Apply the concept of stack and queues using arrays and linked list.
CO3	Explain the operations on linked list data structure.
CO4	Develop algorithms for different operations on nonlinear data structures.
CO5	Identify the searching & sorting techniques for good algorithms.
Course Name: Object Oriented Programming (BTCS 302-18)	
CO1	Interpret the basic characteristics, concepts & importance of OOP.
CO2	Demonstrate the concept of constructors and destructors.
CO3	Explain various types of Inheritance.
CO4	Apply the concept of data encapsulation and polymorphism with virtual functions
CO5	Make use of file handling, exception handling and I/O manipulators for programming.
Course Name: Mathematics-III (BTAM 304-18)	
CO1	Find the Partial derivatives and its application in related field of engineering
CO2	Apply integral formula to find length, area, surface area and volume of revolution of a curve.
CO3	Solve mathematical problems related to convergence and divergence of sequence and series.
CO4	Solve differentiation equation of first order and first degree using various method.
CO5	Apply different Method to solve higher order differential equation
Course Name: Foundation Course in Humanities (Development of Societies/Philosophy)- HSMC101/102-18	
CO1	Outline the responsibilities towards the local, national and global societies
CO2	Illustrate current political scenario of the world that will help to think critically and independently about the world political system
CO3	Distinguish between various political theories.
CO4	Explain core economic terms, concepts, and theories.
CO5	Compare various competent theories of economic development.

Course Name: Digital Electronics Lab (BTES 302-18)	
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CO2	Convert binary, hexadecimal, octal numbers to their decimal equivalent and vice versa, Apply concepts of Boolean algebra for handling logical expressions.
CO3	Demonstrate working and realization of Combinational Circuits.
CO4	Explain the operation of a flip-flop. Design counters and clear the concept of shift registers
CO5	Illustrate different types of memories and their applications. Convert digital signal into analog and vice versa.
Course Name: Data structure & Algorithms Lab (BTCS 303-18)	
CO1	Construct linear data structures such as stacks, queues using linked lists and arrays.
CO2	Compare various searching and sorting algorithms.
CO3	Choose appropriate non-linear data structures (such as trees & graphs) algorithm to solve various computing problems.
CO4	Identify suitable data structure and algorithm to solve a real-world problem
Course Name: Object Oriented Programming lab(BTCS 304-18)	
CO1	Develop classes incorporating object-oriented techniques
CO2	Demonstrate the concept of constructors and destructors in program design.
CO3	Develop programs using different forms of Inheritance.
CO4	Apply the concepts of type conversions & polymorphism.
CO5	Make use of file handling, Exceptions & templates in C++ to understand generic programming.
Course Name: IT Workshop (BTCS 305-18)	
CO1	Explain the functionality of Motherboard and assembling of computer Parts.
CO2	Analyze to trouble shoot the system.
CO3	Demonstrate installation of system software and application software.
CO4	Apply installation steps of MS-Office, Adobe Photoshop and C and C++
CO5	Define the configuration of Database packages.

4TH SEMESTER	
Course Name: Discrete Mathematics (BTCS 401-18)	
CO1	Define the concept of sets, relations and functions.
CO2	Apply principle of mathematical induction and basic counting principle in applications.
CO3	Apply propositional logic for the validity of arguments
CO4	Make use of algebraic structures, Boolean algebra and Boolean ring in various applications.
CO5	Develop an understanding of graph and trees for solving problems arising in the computer science.
Course Name: Computer Organization & Architecture (BTES 401-18)	
CO1	Outline the basic functional units, number representation and instruction set of a digital computer.
CO2	Explain the data processing operations of central processing unit and control unit.
CO3	Select appropriate interfacing standards for I/O devices.
CO4	Apply/Illustrate the concepts of pipelining techniques to the processor.
CO5	Explain the memory hierarchy system.
Course Name: Operating Systems (BTCS 402-18)	
CO1	Explain the concepts and generations of operating system
CO2	Illustrate process and its inter-process communication.
CO3	Make use of CPU scheduling algorithms, deadlock detection and prevention algorithms for process execution
CO4	Explain various memory management techniques.
CO5	Explain the concept of I/O management, file management and disk Management.
Course Name: Design & Analysis of Algorithms (BTCS403-18)	
CO1	Compare and analyze the performance of algorithms.
CO2	Choose appropriate algorithm design techniques for solving problems using design paradigm (greedy/ divide and conquer/backtrack etc.)
CO3	Illustrate the major graph algorithms and their analysis.
CO4	Demonstrate the ways to analyze sorting and searching techniques.
CO5	Examine the necessity for NP class-based problems and explain the use of Heuristics Algorithms and Approximation algorithms.
Course Name: Universal Human Values 2(HSMC 122-18)	
CO1	Illustrate the various basis of value education.
CO2	Explain the harmony of “I” in relation with the “body”
CO3	Develop harmony in human to human relationship.
CO4	Interpret harmony in the nature & all levels of existence.
CO5	Demonstrate the awareness of professional ethics in society.
Course Name: Environmental Sciences (EVS101-18)	
CO1	Illustrate the various basis of value education.

CO2	Explain the harmony of “I” in relation with the “body”
CO3	Develop harmony in human to human relationship.
CO4	Interpret harmony in the nature & all levels of existence.
CO5	Demonstrate the awareness of professional ethics in society.
Course Name: Computer Organization & Architecture Lab (BTES 402-18)	
CO1	Demonstrate the process of dismantling and assembling of personal computer.
CO2	Construct the various assembly language programs for basic arithmetic and logical operations in 8085 microprocessors.
CO3	Construct the various assembly language programs for basic arithmetic and logical operations in 8086 microprocessors.
CO4	Demonstrate the functioning of microprocessor-based systems with I/O interface.
Course Name: Operating Systems Lab (BTCS 404-18)	
CO1	Make use of basic services and functionalities of the operating system.
CO2	Analyze various CPU Scheduling Algorithms
CO3	Illustrate virtualization and installation of OS on a virtual machine
CO4	Make use of function commands for files and directories.
CO5	Create various shell scripts.
CO6	Evaluate deadlock avoidance algorithm.
Course Name: Design & Analysis of Algorithms Lab (BTCS 405-18)	
CO1	Design algorithms using appropriate design techniques (divide and Conquer, greedy, dynamic programming, etc.)
CO2	Implementation of algorithms such as sorting, graph traversal, trees, etc.in a high-level language.
CO3	Analyze and compare the performance of algorithms using Some notations.
CO4	Apply and implement learned algorithm design techniques to solve real world problems.

5TH SEMESTER	
Course Name: Enterprise Resource Planning (BTES 501-18)	
CO1	Provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
CO2	Focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach.
CO3	Train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth
CO4	Aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.
CO5	Focuses on major aspects of e-commerce: business development and strategy, technological innovations, and social and legal issues and impacts.
Course Name: Database Management Systems (BTCS 501-18)	
CO1	To study the physical and logical database designs, database modeling, relational, hierarchical, object-oriented and network models.
CO2	To understand and use data manipulation language to query, update, and manage a Database.
CO3	Design ER-models to represent simple database application scenarios
CO4	Formulate data retrieval queries in SQL and the Relational Algebra and Calculus.
CO5	improve the database design by normalization using the design guidelines and functional dependencies.
CO6	To familiarize issues of Transaction Processing, Concurrency Control and database recovery.
Course Name: Formal Language & Automata Theory (BTCS 502-18)	
CO1	Explain a formal notation for strings, languages and machines.
CO2	Build finite automata to accept a set of strings of a language.
CO3	Apply context free grammars to generate strings of context free language.
CO4	Analyze equivalence of languages accepted by Push Down Automata and languages generated by context free grammars.
CO5	Distinguish between computability and non-computability and Decidability and undecidability.
Course Name: Software Engineering (BTCS 503-18)	
CO1	Select a software engineering process life cycle model.
CO2	Explain the requirements of the software.
CO3	Analyze the given specification into a design
CO4	Contrast the various testing and quality assurance techniques.
CO5	Apply modern engineering tools for specification, design, implementation, and testing
Course Name: Computer Networks (BTCS 504-18)	
CO1	Explain the functions of the different layer of the OSI Protocol.

CO2	Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
CO3	Develop the network programming for a given problem related TCP/IP protocol.
CO4	Compare Transmission Control Protocol (TCP) and User Datagram Protocol (UDP)
CO5	Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.
Course Name: Constitution of India/ Essence of Indian Traditional Knowledge (Mandatory Courses)	
CO1	Understand the meaning of Indian constitution and its preamble
CO2	Explain the working of Union Government
CO3	Illustrate the working of state Government
CO4	Explain the role of Local Government
CO5	Illustrate the role of Election Commission
Course Name: Database Management Systems Lab (BTCS 505-18)	
CO1	Demonstrate installation of database packages/tools and basic SQL concepts.
CO2	Build efficient database using database language commands.
CO3	Analyze the database using queries to retrieve records
CO4	Formulate queries using SQL solutions to a broad range of query problems.
CO5	Apply PL/SQL for processing database
Course Name: Software Engineering Lab (BTCS 506-18)	
CO1	Identify a software engineering process life cycle.
CO2	Define the requirements of the software.
CO3	Analyze the given specification into a design
CO4	Contrast the various testing and quality assurance techniques.
CO5	Apply modern engineering tools for specification, design, implementation, and testing
Course Name: Computer Networks Lab (BTCS 507-18)	
CO1	Explain the different types of Network cables and network topologies
CO2	Describe the function of various Networking Devices
CO3	Explain the network Simulation of web traffic in Packet Tracer
CO4	Configure networks using the concept of subnetting
CO5	Configure networks using static and default routes
Course Name: Programming in Python (BTCS 510-18)- ELECTIVE-I	
CO1	Make use of python standard data types, objects, operators and functions.
CO2	Apply file handling, exception handling and string operations.
CO3	Make use of multithreading programming in python.
CO4	Apply GUI and Web programming in python.
CO5	Make use of database programming in python.
Course Name: Programming in Python Lab (BTCS 513-18)- ELECTIVE-I Lab	
CO1	Apply various kinds of operators in python program

CO2	Make use of list, tuple and dictionaries in python
CO3	Apply various control structures in python programs
CO4	Make use of file handling in python
CO5	Identify various string related function and operations

6TH SEMESTER	
Course Name: Compiler Design(BTCS 601-18)	
CO1	Explain the concepts of lexical analysis with regular expression of finite automata.
CO2	Analyze various parsing algorithms of parser
CO3	Identify the techniques of Intermediate code generation.
CO4	Explain the role of run time environment and memory organization.
CO5	Apply code optimization techniques for advanced language features.
Course Name: Artificial Intelligence(BTCS 602-18)	
CO1	Build intelligent agents for search and games
CO2	Solve AI problems by using various algorithms and strategies
CO3	Make use of probability models to handle uncertainty
CO4	Choose optimization and inference algorithms for model learning
CO5	Apply reinforcement agent to learn and act in a structured environment
Course Name: Compiler Design Lab(BTCS 604-18)	
CO1	Design lexical analyser for a given language
CO2	Develop programs for strings and identifiers.
CO3	Make use of new tools and techniques for implementing lexical analyser
CO4	Develop programs for solving parser problems
CO5	Create a programs for YACC and abstract syntax tree.
Course Name: Artificial Intelligence Lab(BTCS 605-18)	
CO1	Describe basic knowledge of Python programming in order to write python programs for search techniques.
CO2	Demonstrate with the basic concepts of building the Bayesian network.
CO3	Apply programming skills to infer from the Bayesian network.
CO4	Analyze a small AI system to run value and policy iteration in a grid network
CO5	Apply the development skills in reinforcement learning in a grid world.
Course Name: Open Elective-I(Microprocessor & Microcontrollers BTEC 402-18)	
CO1	Understand architecture & functionalities of different building block of 8085 microprocessor
CO2	Understand working of different building blocks of 8051 microcontroller.
CO3	Comprehend and apply programming aspects of 8051 microcontroller.
CO4	Interface & interact with different peripherals and devices
Course Name: Cloud computing (BTCS 612-18)- ELECTIVE-II	
CO1	Explain the core concepts of the cloud computing paradigm
CO2	Illustrate the importance of virtualization along with their technologies
CO3	Analyze various cloud computing service and deployment models
CO4	Apply the various security strategies for different cloud platform

CO5	Describe the different platforms for cloud computing such as IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform.
Course Name: Cloud computing Lab(BTCS 613-18)- ELECTIVE-II Lab	
CO1	Explain the core concepts of the cloud computing paradigm
CO2	Illustrate the importance of virtualization along with their technologies
CO3	Analyze various cloud computing service and deployment models
CO4	Apply the various security strategies for different cloud platform
CO5	Describe the different platforms for cloud computing such as IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform.
Course Name: Data Science(BTCS 616-18)-ELECTIVE-III	
CO1	Illustrate the basics of data science
CO2	Explain transformation and merging of data for use in analytic tools
CO3	Make use of statistics in the field of data science
CO4	Apply linear and multiple linear regression algorithm
CO5	Build model for data analysis and evaluation
Course Name: Data Science Lab(BTCS 617-18)-ELECTIVE-III Lab	
CO1	Identify the impact of data analytics for business decisions and strategy
CO2	Apply various Data Architecture for deriving solutions
CO3	Make use of data analysis/ statistical analysis Algorithms
CO4	Apply standard data visualization and formal inference procedures
CO5	Make use of various regression algorithms

7TH SEMESTER	
Course Name: Distributed databases(BTCS 706-18)-ELECTIVE-IV	
CO1	Illustrate the database models and computer network conc concepts, Transparencies in a distributed DBMS; Distributed D DBMS architecture; Global directory issue for relevant a applications.
CO2	A Apply design strategies; Distributed design issues; fragmentation; Data location, View management; Data security; Semantic Integrity Control, Objectives of query processing
CO3	Make use of various optimization techniques for the efficient retrieval of information from a database.
CO4	Demonstrate transaction processing, concurrency control & security mechanisms.
CO5	Reliability issues in DDBSs; Types of failures;reliability; commit protocols; various recovery protocol
Course Name: Distributed databases Lab(BTCS 707-18)-ELECTIVE-IV Lab	
CO1	Apply basic SQL concept and decomposition methods of normalization
CO2	Inference database query optimization tools to tune the stored database.
CO3	Analyze the database, the backup and recovery procedures with server administration.
CO4	Implement object oriented query language and mining techniques on databases
CO5	Applying the query techniques on real world web databases.
Course Name: Parallel Computing(BTCS 714-18)-ELECTIVE-V	
CO1	Demonstrate the fundamental principles of parallel computing and classifications
CO2	Explain different Abstract parallel computational models
CO3	Interpret different parallel processors : Taxonomy and topology
CO4	Identify parallel programming
CO5	Demonstrate the concept of various scheduling and parallizations
Course Name:Parallel Computing Lab(BTCS 714-18)-ELECTIVE-V Lab	
CO1	Outline the advantages, issues and challenges of the current processors
CO2	Classify how to optimize a parallel code.
CO3	Show the various parallel programming paradigms and learn how to choose the right one based on the application domain.
CO4	Explain parallel codes that are optimized for performance.
Course Name: Network Security and Cryptography(BTCS 701-18)	
CO1	Describe the fundamental principles of access control models, authentication and secure system design
CO2	Illustrate Euclidean algorithm and Euler Theorem
CO3	Explain different cryptographic protocols and techniques.
CO4	Apply methods for authentication, access control, intrusion detection and prevention.
CO5	Demonstrate various network security applications, IPSec, Firewall, IDS, Web Security, Email Security and Malicious software etc

Course Name: Data Mining and Data Warehousing (BTCS 702-18)

CO1	Define the scope and necessity of Data Warehousing & Mining.
CO2	Explain various data pre-processing techniques for improving the quality of data.
CO3	Illustrate the concept of data classification methods or Frequent Pattern mining on large data sets.
CO4	Identify the appropriate data mining methods like clustering and search engine.
CO5	Classify the basic techniques and tools for analyzing the Web structure and Web access.

Course Name: Mobile Communication & Networks (BTEC-908B-18)-Open Elective-II

CO1	Define in depth knowledge of the cellular communications concepts and techniques.
CO2	Explain the working principles of the mobile communication systems.
CO3	Relate the relation between the user features and underlying technology.
CO4	Illustrate mobile communication systems for improved performance.
CO5	Define the technology behind GSM and CDMA cellular standards.