B.Tech (Artificial Intelligence and Machine Learning)
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)	
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)
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	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: Statistical Computing Techniques using R (BTES 501-20)	
CO1	Describe the critical R programming concept
CO2	Demonstrate how to install and configure R studio
CO3	Explain the analysis of data and to generate reports based on the data
CO4	Illustrate the modern concept of statistics based on simulation and writing a report of a quantitative analysis
CO5	Apply various concept to write programs in R
Course Name: Database Management Systems (BTCS 501-18)	
CO1	Illustrate the database models for relevant applications.
CO2	Apply relational algebra and normalization techniques for effective database design.
CO3	Make use of various optimization techniques for efficient retrieval of information from a database.
CO4	Demonstrate transaction processing, concurrency control & security mechanisms.
CO5	Compare different storage structures & advanced databases.
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: Programming in Python (BTAIML 501-20)	
CO1	Examine python syntax, standard data types, operators, and functions.
CO2	Apply control structures and string operations.
CO3	Make use of functions and Modules
CO4	Apply File Systems and exception handling, and OOPS in python
CO5	Build exemplary applications using date and time, generators, iterators, and collections in Python.
Course Name: Artificial Intelligence (BTAIML 502-20)	
CO1	Understand different types of AI agents.
CO2	Develop different types of various AI search algorithms.
CO3	Construct simple knowledge-based systems and to apply knowledge representation.

CO4	Convert intermediate representation in contest to understand learning.
CO5	Apply for various techniques for Expert Systems

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: Statistical Computing Techniques using R Lab (BTCS 502-20)	
CO1	Able to understand R standard data types, objects, Data frames, charts, operators and functions.
CO2	Understand list, matrices, and vector and control structure i R
CO3	Implement the mean, variance, median, and standard deviation problem in R
CO4	Able to understand various Plots and charts in R
CO5	Discuss the Various Statistical operations and Graphics in R

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: Artificial Intelligence Lab (BTAIML 504-20)	
CO1	Explain artificial intelligence, its characteristics and its application areas.
CO2	Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.
CO3	Apply appropriate algorithms and AI techniques to solve complex problems.
CO4	Develop an expert system by using appropriate tools and techniques

Course Name: Programming in Python Lab (BTCS 503-20)	
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

Course Name: Java Programming(BTAIML 509-20)-ELECTIVE-I	

CO1	Demonstrate and understand the concepts of Java programming and its environment.
CO2	Outline the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP like Encapsulation, Inheritance and Polymorphism.
CO3	Utilize packages, exception handling, AWT components and multithreaded processes as per needs and specifications and design an object oriented system.
CO4	Develop GUI interfaces with the help of Java Programming.
CO5	Make use of the database connectivity and web based applications on client server model.
Course Name: Java Programming Lab(BTAIML 510-20)-ELECTIVE-I Lab	
CO1	Use Java compiler and eclipse platform to write and execute java program.
CO2	Understand and Apply Object oriented features and Java concepts.
CO3	Apply the concept of multithreading and implement exception handling.
CO4	Access data from a Database with java program.
CO5	Develop applications using Console I/O and File I/O,GUI applications

6TH SEMESTER	
Course Name: Computer Networks (BTCS 504-20)	
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: Machine Learning (BTCS 619-18)	
CO1	Analyze Methods and theories in The field of Machine Learning
CO2	Analyze and Extract features of complex data sets.
CO3	Deploy techniques to comment for the Regression
CO4	Comprehend and apply different classification and clustering techniques
CO5	Understand the concept of Neural Networks and Genetic Algorithms
Course Name: Data Mining and Data Warehouse (BTCS 702-18)-ELECTIVE-II	
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: Neural Networks (BTAIML 603-20)	
CO1	Explain the learning and generalization issue in neural computation
CO2	Interpret the basic ideas behind most common learning algorithms for multilayer perceptron.
CO3	implement common learning algorithm using and existing package
CO4	Apply neural network to classification and recognition problem
CO5	Classify the radial basic function network
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: Machine Learning Lab (BTCS620-18)	
CO1	Discuss various kind of Machine learning tools.
CO2	Implement data Preprocessing, KNN, K-means and genetic algorithms.
CO3	Organize Random forest classification, SVM and Apriori algorithm.
CO4	Design Multiple Linear Regression, Naive Bayes algorithm and ANN.
	Course Name: Data Mining and Data Warehouse Lab (BTAIML609-20) ELECTIVE-II LAB
CO1	Analyze various data mining and data warehouse
CO2	Discuss various machine learning algorithms like classification, clustering and etc. in large data sets.
CO3	Make use of various data mining algorithms as a component to the exiting tools.
CO4	Determine Data mining techniques for realistic data.
	Course Name: Neural Networks Lab (BTAIML604-20) ELECTIVE-III LAB
CO1	Develop programs for basic matrix operations using Pyton/MATLAB.
CO2	Make use of various graphical representations.
CO3	Analyze the effect of neurons using weight and biased values.
CO4	Experiment with perception learning rules for various problems.
CO5	Develop programs for basic matrix operations using pyton/matlab.
	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
CO5	Understand architecture & functionalities of different building block of 8085 microprocessor