

Kalinga University

Technology

Bachelor Of Technology (Computer Science Engineering)

PO

S. No.	Program Outcome (PO) Description
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO

S. No.	Program Specific Outcome (PSO) Description
1	Model computational problems by applying mathematical concepts and design solutions using suitable data structures and algorithmic techniques
2	Design and develop solutions by following standard software engineering principles and implement by using suitable programming languages and platforms
3	Develop system solutions involving both hardware and software modules
4	Understand, Analyze and Develop computer programs for efficient design of computer-based systems of varying complexity.
5	Demonstrate basic knowledge of computer applications and apply standard practices in software project development.

CO

S.No.	Course Code	Course Name	Course Outcome (CO's) - Description
1	BTCS101	Programming for Problem Solving	CO1: To develop simple algorithms for arithmetic and logical problems.
			CO2: To translate the algorithms to programs & execution (in C language).
			CO3: To implement conditional branching, iteration and recursion.
			CO4: To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
			CO5: To use arrays, pointers and structures to develop algorithms and programs.
2	BTCS102	BASIC ELECTRICAL ENGINEERING	CO1: Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
			CO2: Analyze the steady state behavior of single phase and three phase AC electrical circuits.
			CO3: Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
			CO4: Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
			CO5: Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.
3	BTCS103	ENGINEERING PHYSICS	CO1: To solve the classical and wave mechanics problems
			CO2: To develop the understanding of laws of thermodynamics and their application in various processes
			CO3: To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
			CO4: To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams
4	BTCS104	ENGINEERING MATHEMATICS-I	CO1: Remember the concept of matrices and apply for solving linear simultaneous equations.
			CO2: Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
			CO3: Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
			CO4: Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
			CO5: Remember the concept of vector and apply for directional derivatives, tangentand normal planes. Also evaluate line, surface and volume integrals.

5	BTCS105	ENGLISH	CO1: Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
			CO2: Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
			CO3: Students will apply it at their work place for writing purposes such as Presentation/official drafting / administrative communication and use it for document/project/report/research paper writing.
			CO4: Students will be made to evaluate the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.
			CO5: Students will apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.
6	BTCS106	Emerging Technology for Engineers	CO1: Understand the concepts of internet of things, smart cities and industrial internet of things
			CO2: Understand the concepts of cloud computing
			CO3: Understand the concepts of block chain, cryptocurrencies, smart contracts
			CO4: Understand design principles, tools, trends in 3 D printing and drones
			CO5: Understand augmented reality (AR), virtual reality (VR), 5G technology, brain computer interface and human brain
7	BTCS201	Fundamentals of Mechanical Engineering & Mechatronics	CO1: Identification of key elements of mechatronics system and its representation in terms of block diagram
			CO2: Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
			CO3: Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
			CO4: Time and Frequency domain analysis of system model (for control application)
			CO5: PID control implementation on real time systems
			CO6: Development of PLC ladder programming and implementation of real life system.
8	BTCS202	EMERGING DOMAIN IN ELECTRONICS ENGINEERING	CO1: Understand the concept of PN Junction and devices.
			CO2: Understand the concept of BJT, FET and MOFET.
			CO3: Understand the concept of Operational amplifier
			CO4: Understand the concept of measurement instrument.

		ENGINEERING	CO5: Understand the working principle of different type of sensor and their uses. CO6: Understand the concept of IoT system & Understand the component of IoT system
9	BTCS203	ENGINEERING CHEMISTRY	CO1: Use of different analytical instruments. CO2: Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water. CO3: Measure hardness of water. CO4: Estimate the rate constant of reaction.
10	BTCS204	Engineering Mathematics-II	CO1: Understand the concept of differentiation and apply for solving differential equations. CO2: Remember the concept of definite integral and apply for evaluating surface areas and volumes. CO3: Understand the concept of convergence of sequence and series. Also evaluate Fourier series CO4: Illustrate the working methods of complex functions and apply for finding analytic functions. CO5: Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals
11	BTCS205	Environmental Science	CO1: Understand the fundamental principles and concepts of environmental science, including ecosystems, biodiversity, natural resources, pollution, and sustainability. CO2: Recognize and analyze the impacts of human activities on the environment, including pollution, deforestation, climate change, and habitat destruction. CO3: Evaluate and apply scientific methods and tools for studying and monitoring the environment, including data collection, analysis, and interpretation. CO4: Develop an awareness of environmental laws, policies, and regulations, and their implications for environmental protection and sustainability. CO5: Apply critical thinking skills to assess and propose solutions to environmental challenges, such as resource management, pollution control, and conservation. CO6: Enhance communication skills through effective presentation and discussion of environmental issues, both orally and in writing. CO7: Foster an appreciation for the value of biodiversity, natural ecosystems, and the interdependence of humans and the environment. CO8: Foster a sense of personal responsibility and ethical consideration towards the environment and promote sustainable practices in daily life.
12	BTCS206	Artificial Intelligence for Engineers	CO1: Understand the evolution and various approaches of AI CO2: Understand data storage, processing, visualization, and its use in regression, clustering etc. CO3: Understand natural language processing and chatbots CO4: Understand the concepts of neural networks.

			CO5: Understand the concepts of face, object, speech recognition and robots.
13	BTCS301	Mathematics-III	CO1: The idea of partial differentiation and types of partial differential equations
			CO2: The idea of classification of second partial differential equations, wave , heat equation and transmission lines
			CO3: The basic ideas of statistics including measures of central tendency, correlation, regression and their properties.
			CO4: The idea s of probability and random variables and various discrete and continuous probability distributions and their properties.
			CO5: The statistical methods of studying data samples, hypothesis testing and statistical quality control, control charts and their properties.
14	BTCS302	Technical Communication	CO1: Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
			CO2: Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
			CO3: Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
			CO4: Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
15	BTCS303	DATA STRUCTURE	CO5: It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.
			CO1: Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory,
			CO2: Discuss the computational efficiency of the sorting and searching algorithms.
			CO3: Implementation of Trees and Graphs and perform various operations on these data structure.
			CO4: Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.
16	BTCS304	Computer Organization and Architecture	CO5: Identify the alternative implementations of data structures with respect to its performance to solve a real worldproblem.
			CO1: Study of the basic structure and operation of a digital computer system.
			CO2: Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating- point arithmetic operations.
			CO3: Implementation of control unit techniques and the concept of Pipelining
			CO4: Understanding the hierarchical memory system, cache memories and virtual memory

			CO5: Understanding the different ways of communicating with I/O devices and standard I/O interfaces
17	BTCS305	Discrete Structures & Theory of Logic	CO1: Write an argument using logical notation and determine if the argument is or is not valid. CO2: Understand the basic principles of sets and operations in sets. CO3: Demonstrate an understanding of relations and functions and be able to determine their properties. CO4: Demonstrate different traversal methods for trees and graphs. CO5: Model problems in Computer Science using graphs and trees.
18	BTCS306	Constitution of India, Law & Engineering	CO1: To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it. CO2: To make students aware of the theoretical and functional aspects of the Indian Parliamentary System. CO3: To channelize students' thinking towards basic understanding of the legal concepts and its implications for engineers. CO4: To acquaint students with latest intellectual property rights and innovation environment with related regulatory framework. CO5: To make students learn about role of engineering in business organizations and e-governance.
19	BTCS401	PYTHON PROGRAMMING	CO1: To read and write simple Python programs. CO2: To develop Python programs with conditionals and loops. CO3: To define Python functions and to use Python data structures -- lists, tuples, dictionaries CO4: To do input/output with files in Python CO5: To do searching ,sorting and merging in Python
20	BTCS402	Universal Human Values	CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society. CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body. CO3: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society. CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.

			CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
21	BTCS403	Operating system	CO1: Understand the structure and functions of OS
			CO2: Learn about Processes, Threads and Scheduling algorithms.
			CO3: Understand the principles of concurrency and Deadlocks
			CO4: Learn various memory management scheme
			CO5: Study I/O management and File systems.
22	BTCS404	Theory of Automata and Formal Languages	CO1: Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars
			CO2: Analyse and design, Turing machines, formal languages, and grammars
			CO3: Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving
			CO4: Prove the basic results of the Theory of Computation.
			CO5: State and explain the relevance of the Church-Turing thesis.
23	BTCS405	Microprocessor	CO1: Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
			CO2: Analyze a detailed s/w & h/w structure of the Microprocessor.
			CO3: Illustrate how the different peripherals (8085/8086) are interfaced with Microprocessor.
			CO4: Analyze the properties of Microprocessors(8085/8086)
			CO5: Evaluate the data transfer information through serial & parallel ports.
24	BTCS406	Indian Traditions, Cultural and Society	CO1: Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.
25	BTCS501	Database Management System	CO1: Apply knowledge of database for real life applications.
			CO2: Apply query processing techniques to automate the real time problems of databases.
			CO3: Identify and solve the redundancy problem in database tables using normalization.
			CO4: Understand the concepts of transactions, their processing so they will familiar with broad range of database management issues including data integrity, security and recovery.
			CO5: Design, develop and implement a small database project using database tools.
			CO1: Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.
			CO2: Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.

26	BTCS502	Compiler Design	CO3: Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes. CO4: Acquire knowledge about run time data structure like symbol table organization and different techniques used in that. CO5: Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.
27	BTCS503	Design and Analysis of Algorithm	CO1: Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands. CO2: Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate). CO3: Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms. CO4: Apply classical sorting, searching, optimization and graph algorithms. CO5: Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.
28	BTCS504A	Data Analytics	CO1: Describe the life cycle phases of Data Analytics through discovery, planning and building. CO2: Learn various Data Analysis Techniques. CO3: Implement various Data streams. CO4: Understand item sets, Clustering, frame works & Visualizations. CO5: Apply R tool for developing real time applications..
29	BTCS504B	Web Designing	CO1: Understand principle of Web page design and about types of websites CO2: Visualize and Recognize the basic concept of HTML and application in web designing. CO3: Recognize and apply the elements of Creating Style Sheet (CSS). CO4: Understanding the basic concept of Java Script and its application. CO5: Introduce basics concept of Web Hosting and apply the concept of SEO
30	BTCS504C	Computer Graphics	CO1: Understand the graphics hardware used in field of computer graphics. CO2: Understand the concept of graphics primitives like lines and circle based on different algorithms. CO3: Apply the 2D graphics transformations, composite transformation and Clipping concepts . CO4: Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations CO5: Perform the concept of projections, curve and hidden surfaces in real life.
			CO1: Recognize the feasibility of applying a soft computing methodology for a particular problem

31	BTCS504D	Application of Soft Computing	CO2: Know the concepts and techniques of soft computing and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems. CO3: Apply neural networks to pattern classification and regression problems and compare solutions by various soft computing approaches for a given problem. CO4: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems CO5: Apply genetic algorithms to combinatorial optimization problems
32	BTCS505A	Machine Learning Techniques	CO1: To understand the need for machine learning for various problem solving CO2: To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning CO3: To understand the latest trends in machine learning CO4: To design appropriate machine learning algorithms for problem solving CO5: To understand the need for machine learning for various problem solving
33	BTCS505B	Object Oriented System Design	CO1: To Understand the application development and analyze the insights of object oriented programming to implement application CO2: To Understand, analyze and apply the role of overall modeling concepts (i.e. System, structural) CO3: To Understand, analyze and apply oops concepts (i.e. abstraction, inheritance) CO4: To learn concepts of C++ for understanding the implementation of object oriented concepts CO5: To learn the programming concepts to implement object oriented modeling.
34	BTCS505C	Augmented & Virtual Reality	CO1: To make students know the basic concept and framework of virtual reality. CO2: To teach students the principles and multidisciplinary features of virtual reality. CO3: To teach students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior. CO4: To teach students the technology for managing large scale VR environment in real time. CO5: To provide students with an introduction to the AR system framework and development tools.
35	BTCS505D	Human Computer Interface	CO1: Critically discuss common methods in the user-centered design process and the appropriateness of individual methods for a given problem. CO2: Use, adapt and extend classic design standards, guidelines, and patterns. CO3: Employ selected design methods and evaluation methods at a basic level of competence. CO4: Build prototypes at varying levels of fidelity, from paper prototypes to functional, interactive prototypes.

			CO5: Demonstrates sufficient theory of human computer interaction, experimental methodology and inferential statistics to engage with the contemporary research literature in interface technology and design.
36	BTC SOE506A	Real Time Systems	CO1: Describe concepts of Real-Time systems and modeling.
			CO2: Recognize the characteristics of a real-time system in context with real time scheduling.
			CO3: Classify various resource sharing mechanisms and their related protocols.
			CO4: Interpret the basics of real time communication by the knowledge of real time models and protocols.
			CO5: Apply the basics of RTOS in interpretation of real time systems.
37	BTC SOE506B	Embedded System	CO1: Understand the basics of embedded system and its structural units.
			CO2: Analyze the embedded system specification and develop software programs.
			CO3: Evaluate the requirements of the programming embedded systems, related software architecture.
			CO4: Understand the RTOS based embedded system design.
			CO5: Understand all the applications of the embedded system and designing issues.
38	BTC SOE506C	Introduction to Mems	CO1: Understand the Basic concept of MEMS Fabrication Technologies, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.
			CO2: Explain Mechanics of Beam and Diaphragm Structures.
			CO3: Understand the Basic concept of Air Damping and Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.
			CO4: Know the concept of Electrostatic Actuation.
			CO5: Understand the applications of MEMS in RF
39	BTC SOE506D	Object Oriented Programming	CO1: Apply Java in developing Object Oriented code.
			CO2: Apply the knowledge of Multi-threading and Streams in developing Java applications.
			CO3: Design and implement applications using GUI and Networking in Java.
			CO4: Apply the knowledge of Collections and Generics for building Java applications.
			CO5: Design and develop Java based applications for solutions to real world problems.
40	BTC SOE506E	Numerical Techniques	CO1: Understand about the basics of Ordinary Differential Equations, Separable equations, Equations made separable by change of variables.
			CO2: Retrieve the information content of Power series method.
			CO3: Apply problem specific Bessel's equation, Bessel Functions to engineering applications.
			CO4: Understand about the basics of matrix, Eigen values and eigen vectors.

			CO5: Analysis of Stage wise Processes by the Calculus of Finite Differences, Countercurrent Liquid- Liquid Extraction.
41	BTC SOE506F	Gis & Remote Sensing	CO1: Understand about the principles of Remote Sensing and its advantages and limitations.
			CO2: Retrieve the information content of remotely sensed data.
			CO3: Apply problem specific remote sensing data for engineering applications.
			CO4: Analyze spatial and attribute data for solving spatial problems.
			CO5: Create GIS and cartographic outputs for presentation
42	BTC SOE506G	Understanding The Human Being Comprehensively- Human Aspirations And Its Fulfillment	CO1: The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
			CO2: It is free from any dogma or set of do's and don'ts related to values.
			CO3: It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
			CO4: This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
			CO5: This self-exploration also enables them to critically evaluate their preconditioning and present beliefs.
43	BTC S601	Software Engineering	CO1: To learn about generic models of software development process.
			CO2: To understand fundamental concepts of requirements engineering and Analysis Modeling.
			CO3: To understand the different design techniques and their implementation.
			CO4: To learn various testing measures.
			CO5: To learn various maintenance and project management techniques.
44	BTC S602	Web Technology	CO1: Apply the knowledge of the internet and related internet concepts that are vital in understanding web application development and analyze the insights of internet programming to implement complete application over the web.
			CO2: Understand, analyze and apply the role of mark up languages like HTML, DHTML, and XML in the workings of the web and web applications.
			CO3: Use web application development software tools i.e. XML, Apache Tomcat etc. and identifies the environments currently available on the market to design web sites.
			CO4: Understand, analyze and build dynamic web pages using client side programming JavaScript and also develop the web application using servlet and JSP.

			CO5: Understand the impact of web designing by database connectivity with JDBC in the current market place where everyone use to prefer electronic medium for shopping, commerce, fund transfer and even social life also.
45	BTCS603	Computer Networks	CO1: Build an understanding of the fundamental concepts and Layered Architecture of computer networking.
			CO2: Understand the basic concepts of link layer properties to detect error and develop the solution for error control and flow control.
			CO3: Design, calculate, and apply subnet masks and addresses to fulfil networking requirements and calculate distance among routers in subnet.
			CO4: Understanding the duties of transport layer, session layer and presentation layer and also focus on network security issues to secure communication towards society.
			CO5: Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.
46	BTCS604A	Big Data	CO1: Identify Big Data and its business implications.
			CO2: Use various techniques for mining data stream
			CO3: List the components of Hadoop and Hadoop Eco-System.
			CO4: Apply Map Reduce programming model to access and process data on Distributed File System.
			CO5: Manage job execution in Hadoop environment and develop Big Data solutions by applying Hadoop Eco System components
47	BTCS604B	Image Processing	CO1: To become familiar with digital image fundamentals
			CO2: To get exposed to simple image enhancement techniques in Spatial and Frequency domain
			CO3: To learn concepts of degradation function and restoration techniques
			CO4: To study the image segmentation and representation techniques.
			CO5: To become familiar with image compression and recognition method
48	BTCS604C	Data Compression	CO1: To gain a fundamental understanding of data compression methods for text, images, and video, and related issues in the storage, access, and use of large data sets
			CO2: To select, giving reasons that are sensitive to the specific application and particular circumstance, most appropriate compression techniques for text, audio, image and video information
			CO3: To illustrate the concept of various algorithms for compressing text, audio, image and video information.
			CO4: To understand various Distortion criterias
			CO5: To illustrate the Advantages of Vector Quantization over Scalar Quantization.

49	BTCS605A	High Performance Computing	CO1: Provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
			CO2: Introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
			CO3: Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments
50	BTCS605B	CLOUD COMPUTING	CO1: This course gives an introduction to cloud computing and its techniques, issues, and its services that will lead to design and development of a simple cloud service.
			CO2: This course provides the fundamentals and essentials of Cloud Computing, a sound foundation of the Cloud Computing so that it is used for using and adopting Cloud Computing services and tools in the real-life scenarios.
			CO3: This course will be possess skills to design computing systems based on Cloud computing technology and Advancement Hadoop.
51	BTCS605C	Blockchain Architecture Design	CO1: This course will be able to successfully pursue higher education in reputed institutions.
			CO2: This course will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Computer Science and Engineering.
			CO3: This course will be ethically and socially responsible solution providers and entrepreneurs in Computer Science and other engineering disciplines.
52	BTC SOE606A	DIGITAL AND SOCIAL MEDIA MARKETING	CO4: This course will have the ability to explore research areas and produce outstanding contribution in various areas of Systems Engineering.
			CO1: Understand what social media is, the various channels through which it operates, and its role in marketing strategy.
			CO2: Use principles of consumer and social psychology to develop social media content and campaigns that engage consumers.
53	BTC SOE606B	IDEA TO BUSINESS MODEL	CO3: Draw on knowledge about word-of-mouth marketing to develop effective approaches for propagating ideas, messages, products, and behaviors across social networks.
			CO4: Measure the impact of a social media campaign in terms of a specific marketing objective
			CO1: Examine the challenges associated with defining the concepts of entrepreneur and entrepreneurship
			CO2: Discuss how the evolution of entrepreneurship thought has influenced how we view the concept of entrepreneurship today
			CO3: Discuss how the list of basic questions in entrepreneurship research can be expanded to include research inquiries that are important in today's world

			CO4: Discuss how the concepts of entrepreneurial uniqueness, entrepreneurial personality traits, and entrepreneurial cognitions can help society improve its support for entrepreneurship CO5: Apply the general venturing script to the study of entrepreneurship
54	BTC SOE606C	Micro and Smart Systems	CO1: Gain knowledge about basic concepts of Machine Learning CO2: Identify machine learning techniques suitable for a given problem CO3: Solve the problems using various machine learning techniques CO4: Apply Dimensionality reduction techniques. CO5: Design application using machine learning techniques.
55	BTC SOE606D	Renewable Energy Resources	CO1: Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations. CO2: Know the need of renewable energy resources, historical and latest developments. CO3: Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc. CO4: Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications. CO5: Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications CO6: Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations. CO7: Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.
56	BTC SOE606E	OPERATIONS RESEARCH	CO1: Identify and develop operational research models from the verbal description of the real system. CO2: Understand the mathematical tools that are needed to solve optimization problems. CO3: Use mathematical software to solve the proposed models. CO4: Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.
57	BTC S701	Artificial Intelligence	CO1: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. CO2: Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems CO3: Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

			CO4: Demonstrate proficiency in applying scientific method to models of machine learning.
58	BTCS703A	Agile Software Development	CO1: Students should be able to identify the need for engineering approach to software development and various processes of requirements analysis for software engineering problems. CO2: Analyze various software engineering models and apply methods for design and development of software projects. CO3: Identify and apply the principles, processes and main knowledge areas for Software Project Management CO4: Proficiently apply standards, CASE tools and techniques for engineering software projects
59	BTCS703B	Parallel and Distributed Computing	CO1: Account for models, limitations and fundamental concepts within parallel computations with communication based both on message passing and shared memory CO2: Analyse concrete systems and algorithms CO3: Adapt and develop algorithms for execution on parallel and distributed machines and analyse the algorithms with respect to correctness, reliability, safety and performance. CO4: Developing skill set in developing a distributed system.
60	BTCS703C	Quantum Computing	CO1: Design of quantum computers using quantum bits (qubits), quantum gates and quantum circuits. Implementation of basic quantum algorithms, including Deutsch's algorithm, Shor's factoring algorithm, and the search algorithm of Grover. CO2: Understand the quantum Fourier transform and quantum searching. CO3: Ability to design Quantum search for structured database CO4: Understand the trends in Quantum Computing such as Optical Photon Computers, Optical Cavity Quantum electrodynamics.
61	BTCS703D	Software Testing	CO1: Have an ability to apply software testing knowledge and engineering methods. CO2: Have an ability to design and conduct a software test process for a software testing project. CO3: Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation. CO4: Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods. CO5: Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems.
62	BTCS704A	Deep Learning	CO1: To present the mathematical, statistical and computational challenges of building neural networks CO2: To study the concepts of deep learning CO3: To introduce dimensionality reduction techniques

			CO4: To enable the students to know deep learning techniques to support real-time applications CO5: To examine the case studies of deep learning techniques
63	BTCS704B	Service Oriented Architecture	CO1: Comprehend the need for SOA and its systematic evolution. CO2: Apply SOA technologies to enterprise domain. CO3: Design and analyze various SOA patterns and techniques. CO4: Compare and evaluate best strategies and practices of SOA. CO5: Understand the business case for SOA
64	BTCS704C	Mobile Computing	CO1: Explain and discuss issues in mobile computing and illustrate overview of wireless telephony and channel allocation in cellular systems. CO2: Explore the concept of Wireless Networking and Wireless LAN. CO3: Analyse and comprehend Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and Disconnected operations. CO4: Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment. CO5: Compare and contrast various routing protocols and will identify and interpret the performance of network systems using Adhoc networks.network systems using Adhoc networks.
65	BTCS704D	Internet of Things	CO1: Demonstrate basic concepts, principles and challenges in IoT. CO2: Illustrate functioning of hardware devices and sensors used for IoT. CO3: Analyze network communication aspects and protocols used in IoT. CO4: Apply IoT for developing real life applications using Arduinio programming. CO5: To develop IoT infrastructure for popular applications
66	BTCS704E	Cryptography & Network Security	CO1: Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques. CO2: Understand security protocols for protecting data on networks and be able to digitally sign emails and files. CO3: Understand vulnerability assessments and the weakness of using passwords for authentication CO4: Be able to perform simple vulnerability assessments and password audits CO5: Summarize the intrusion detection and its solutions to overcome the attacks.
67	BTCOE705A	FILTER DESIGN	CO1: Choose an appropriate transform for the given signal. CO2: Choose appropriate decimation and interpolation factors for high performance filters. CO3: Model and design an AR system.

			CO4: Implement filter algorithms on a given DSP processor platform.
68	BTC SOE705B	BIOECONOMICS	CO1: Students will be able to understand basic concept of Bioeconomics, challenges, opportunities & regulations
			CO2: Students will be able to understand development and innovation in terms of bioeconomy towards sustainable development
			CO3: Students will be able to understand Inter- and transdisciplinarity in bioeconomy & research approaches
			CO4: Students will be able to explain biobased resources, value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products
69	BTC SOE705C	Design Thinking	CO1: Develop a strong understanding of the design process and apply it in a variety of business settings
			CO2: Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior
			CO3: Formulate specific problem statements of real time issues and generate innovative ideas using design tools
			CO4: Apply critical thinking skills in order to arrive at the root cause from a set of likely causes
			CO5: Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.
70	BTC SOE705E	Quality Management	CO1: Realize the importance of significance of quality.
			CO2: Manage quality improvement teams.
			CO3: Identify requirements of quality improvement programs.
			CO4: Identify improvement areas based on cost of poor quality.
			CO5: Organize for quality and development of quality culture through small group activities.
71	BTC SOE705F	Modeling of Field-Effect Nano Devices	CO1: Study the MOS devices used below 10nm and beyond with an eye on the future.
			CO2: Understand and study the physics behind the operation of multi-gate systems.
			CO3: Design circuits using nano-scaled MOS transistors with the physical insight of their functional characteristics
			CO4: Understand and study the physics behind the Radiation effects in SOI MOSFETs.
			CO5: Understand the impact of device performance on digital circuits.
72	BTC SOE705G	Computerized Process Control	CO1: Understand the Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer.
			CO2: Design Phase Locked Local Loop, Mixers. Time Division Multiplexed System – TDM/PAM system.
			CO3: Realize Process model, Physical model, Control Model. Modelling Procedure.

		CO4: Formulate of Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.
		CO5: Design Electric Oven Temperature Control, Reheat Furnace Temperature control.



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