Department of Computer Engineering

Course Outcomes (CO)

COURSE PATTERN 2019 COMPTER ENGINEERING			
SE COMP SEM-III			
Course Code	**Course Name**	**COs**	**Course Outcomes**
210241	**Discrete Mathematics**	**1**	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly
		2	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
		3	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
			Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
			Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics
		4	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
		5	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.
210242	**Fundamentals of Data Structures**	**1**	Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
		2	Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
		3	Demonstrate use of sequential data structures- Array and Linked lists to store and process data.

		4	Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
		5	Compare and contrast different implementations of data structures (dynamic and static).
		6	Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.
210243	**Object Oriented Programming**	**1**	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
		2	Design object-oriented solutions for small systems involving multiple objects.
		3	Use virtual and pure virtual function and complex programming situations.
		4	Apply object-oriented software principles in problem solving.
		5	Analyze the strengths of object-oriented programming.
		6	Develop the application using object oriented programming language(C++).
210244	**Computer Graphics**	**1**	Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
		2	Apply mathematics to develop Computer programs for elementary graphic operations.
		3	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
		4	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
		5	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
		6	Create effective programs using concepts of curves, fractals, animation and gaming.

210245	**Digital Electronics and Logic Design**	**1**	Simplify Boolean Expressions using K Map.
		2	Design and implement combinational circuits.
		3	Design and implement sequential circuits.
		4	Develop simple real-world application using ASM and PLD.
		5	Differentiate and Choose appropriate logic families IC packages as per the given design specifications
		6	Explain organization and architecture of computer system
210246	**Data Structures Laboratory**	**1**	Use algorithms on various linear data structure using sequential organization to solve real life problems.
		2	Analyze problems to apply suitable searching and sorting algorithm to various applications.
		3	Analyze problems to use variants of linked list and solve various real life problems.
		4	Designing and implement data structures and algorithms for solving different kinds of problems.
210247	**OOP and Computer Graphics Laboratory**	**1**	Understand and apply the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.
		2	Analyze the concept of file and apply it while storing and retrieving the data from secondary storages.
		3	Analyze and apply computer graphics algorithms for line-circle drawing, scan conversion and filling with the help of object oriented programming concepts.
		4	Understand the concept of windowing and clipping and apply various algorithms to fill and clip polygons.
		5	Apply logic to implement, curves, fractals, animation and gaming programs.
210248	**Digital Electronics**	**1**	Understand the working of digital electronic circuits.

	Laboratory	**2**	Apply the knowledge to appropriate IC as per the design specifications.
		3	Design and implement Sequential and Combinational digital circuits as per the specifications.
210249	**Business Communication Skills**	**1**	Express effectively through verbal/oral communication and improve listening skills
		2	Write precise briefs or reports and technical documents.
		3	Prepare for group discussion / meetings / interviews and presentations.
		4	Explore goal/target setting, self-motivation and practicing creative thinking.
		5	Operate effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership qualities
210250	**Humanity and Social Science**	**1**	Aware of the various issues concerning humans and society.
		2	Aware about their responsibilities towards society.
		3	Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes.
		4	Able to understand the nature of the individual and the relationship between self and the community.
		5	Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.
210251	**Audit Course 3 Green Construction and Design**	**1**	Understand the importance of environment friendly society.
		2	Apply primary measures to reduce carbon emissions from their surroundings.
		3	Learn role of IT solutions in design of green buildings.
		4	Understand the use of software systems to complete statutory compliances involved in the design of a new home or office building through green construction.
	Audit Course 3 Social	**1**	Understand social issues and responsibilities as member of society.

	Awareness and Governance Program	**2**	Apply social values and ethics in decision making at social or organizational level
		3	Promote obstacles in national integration and role of youth for National Integration
		4	Demonstrate basic features of Indian Constitution.
	Audit Course 3 Environmental Studies	**1**	Comprehend the importance of ecosystem and biodiversity
		2	Correlate the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and prevention
		3	Identify different types of environmental pollution and control measures
		4	Correlate the exploitation and utilization of conventional and non-conventional resources
	Audit Course 3 Smart Cities	**1**	Understand the dynamic behavior of the urban system by going beyond the physical appearance and by focusing on representations, properties and impact factors
		2	Explore the city as the most complex human-made organism with a metabolism that can be modeled in terms of stocks and flows
		3	Knowledge about data-informed approaches for the development of the future city, based on crowd sourcing and sensing
		4	Knowledge about the latest research results in for the development and management of future cities
		5	Understand how citizens can benefit from data-informed design to develop smart and responsive cities
	Audit Course 3 Foreign Language-Japanese	**1**	Will have ability of basic communication.
		2	Will have the knowledge of Japanese script
		3	Will get introduced to reading , writing and listening skills
		4	Will develop interest to pursue professional Japanese Language course.

COURSE PATTERN 2019 COMPTER ENGINEERING

SE COMP SEM-IV

Course Code	Course Name	COs	Course Outcomes
207003	Engineering Mathematics III	1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
		2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
		3	Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
		4	Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
		5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
210252	Data Structures and Algorithms	1	Identify and articulate the complexity goals and benefits of a good hashing scheme for realworld applications
		2	Apply non-linear data structures for solving problems of various domain.
		3	Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
		4	Analyze the algorithmic solutions for resource requirements and optimization
		5	Use efficient indexing methods and multiway search techniques to store and maintain data.
		6	Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage.
210253	Software Engineering	1	Analyze software requirements and formulate design solution for a software.

		2	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
		3	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
		4	Model and design User interface and component-level.
		5	Identify and handle risk management and software configuration management.
		6	Utilize knowledge of software testing approaches, approaches to verification and validation.
		7	Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.
210254	**Microprocessor**	**1**	Exhibit skill of assembly language programming for the application.
		2	Classify Processor architectures.
		3	Illustrate advanced features of 80386 Microprocessor.
		4	Compare and contrast different processor modes
		5	Use interrupts mechanism in applications
		6	Differentiate between Microprocessors and Microcontrollers
		7	Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.
210255	**Principles of Programmin**	**1**	Make use of basic principles of programming languages.

	g Languages	**2**	Develop a program with Data representation and Computations.
		3	Develop programs using Object Oriented Programming language : Java.
		4	Develop application using inheritance, encapsulation, and polymorphism.
		5	Demonstrate Multithreading for robust application development.
		6	Develop a simple program using basic concepts of Functional and Logical programming paradigm.
210256	**Data Structures and Algorithms Laboratory**	**1**	Understand the ADT/libraries, hash tables and dictionary to design algorithms for a specific problem.
		2	Choose most appropriate data structures and apply algorithms for graphical solutions of the problems.
		3	Apply and analyze non linear data structures to solve real world complex problems.
		4	Apply and analyze algorithm design techniques for indexing, sorting, multi-way searching, file organization and compression.
		5	Analyze the efficiency of most appropriate data structure for creating efficient solutions for engineering design situations.
210257	**Microprocessor Laboratory**	**1**	Understand and apply various addressing modes and instruction set to implement assembly language programs
		2	Apply logic to implement code conversion
		3	Analyze and apply logic to demonstrate processor mode of operation
210258	**Project Based Learning II**	**1**	Identify the real life problem from societal need point of view

		2	Choose and compare alternative approaches to select most feasible one
		3	Analyze and synthesize the identified problem from technological perspective
		4	Design the reliable and scalable solution to meet challenges
		5	Evaluate the solution based on the criteria specified
		6	Inculcate long life learning attitude towards the societal problems
210259	**Code of Conduct**	**1**	Understand the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
		2	Aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
		3	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
		4	Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.
210260	**Audit Course 4 Water Management**	**1**	Understand the global water cycle and its various processes
		2	Understand climate change and their effects on water systems
		3	Understand Drinking treatment and quality of groundwater and surface water
		4	Understand the Physical, chemical, and biological processes involved in water treatment and distribution.
	Audit Course 4 Intellectual	**1**	Understand the fundamental legal principles related to confidential information, copyright, patents, designs, trademarks and unfair competition

	Property Rights and Patents	**2**	Identify, apply and assess principles of law relating to each of these areas of intellectual property
		3	Apply the appropriate ownership rules to intellectual property you have been involved in creating
	Audit Course 4 The Science of Happiness	**1**	Understand what happiness is and why it matters to you
		2	Learn how to increase your own happiness
		3	Understand of the power of social connections and the science of empathy
		4	Understand what is mindfulness and its real world applications
	Audit Course 4 Yoga and Meditation	**1**	Understand philosophy and religion as well as daily life issues will be challenged and enhanced.
		2	Enhances the immune system
		3	Intellectual and philosophical understanding of the theory of yoga and basic related Hindu scriptures will be developed.
		4	Powers of concentration, focus, and awareness will be heightened.
	Foreign Language (Japanese) Module 2	**1**	Have ability of basic communication.
		2	Have the knowledge of Japanese script.
		3	Get introduced to reading , writing and listening skills
		4	Develop interest to pursue professional Japanese Language course

COURSE PATTERN 2019 TE COMPTER ENGINEERING

TE COMP SEM-V

Course Code	Course Name	COs	Course Outcomes
310241	Database Management Systems	1	Analyze and design Database Management System using ER model
		2	Implement database queries using database languages
		3	Normalize the database design using normal forms
		4	Apply Transaction Management concepts in real-time situations
		5	Use NoSQL databases for processing unstructured data
		6	Differentiate between Complex Data Types and analyze the use of appropriate data types
310242	Theory of Computation	1	Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants
		2	Construct regular expression to present regular language and understand pumping lemma for RE
		3	Design Context Free Grammars and learn to simplify the grammar
		4	Construct Pushdown Automaton model for the Context Free Language
		5	Design Turing Machine for the different requirements outlined by theoretical computer science
		6	Understand different classes of problems, classify and analyze them and study concepts of NP completeness

310243	**Systems Programming and Operating System**	**1**	Analyze and synthesize basic System Software and its functionality.
		2	Identify suitable data structures and Design & Implement various System Software
		3	Compare different loading schemes and analyze the performance of linker and loader
		4	Implement and Analyze the performance of process scheduling algorithms
		5	Identify the mechanism to deal with deadlock and concurrency issues
		6	Demonstrate memory organization and memory management policies
310244	**Computer Networks and Security**	**1**	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
		2	Illustrate the working and functions of data link layer
		3	Analyze the working of different routing protocols and mechanisms
		4	Implement client-server applications using sockets
		5	Illustrate role of application layer with its protocols, client-server architectures
		6	Comprehend the basics of Network Security
310245(A)	**Elective I Internet of Things and Embedded Systems**	**1**	Understand the fundamentals and need of Embedded Systems for the Internet of Things
		2	Apply IoT enabling technologies for developing IoT systems
		3	Apply design methodology for designing and implementing IoT applications
		4	Analyze IoT protocols for making IoT devices communication

		5	Design cloud based IoT systems
		6	Design and Develop secured IoT applications
10245(B)	**Elective I Human Computer Interface**	**1**	To design effective Human-Computer-Interfaces for all kinds of users
		2	To apply and analyze the user-interface with respect to golden rules of interface
		3	To analyze and evaluate the effectiveness of a user-interface design
		4	To implement the interactive designs for feasible data search and retrieval
		5	To analyze the scope of HCI in various paradigms like ubiquitous computing, virtual reality ,multi-media, World wide web related environments
		6	To analyze and identify user models, user support, and stakeholder requirements of HCI systems
310245©	**Elective I Distributed Systems**	**1**	Analyze Distributed Systems types and architectural styles
		2	Implement communication mechanism in Distributed Systems
		3	Implement the synchronization algorithms in Distributed System applications
		4	Develop the components of Distributed File System
		5	Apply replication techniques and consistency model in Distributed Systems
		6	Build fault tolerant Distributed Systems
310245(D)	**Elective I Software Project Management**	**1**	Comprehend Project Management Concepts
		2	Use various tools of Software Project Management

		3	Schedule various activities in software projects
		4	Track a project and manage changes
		5	Apply Agile Project Management
		6	Analyse staffing process for team building and decision making in Software Projects and Management
310249	**Seminar and Technical Communication**	**1**	Analyze a latest topic of professional interest
		2	Enhance technical writing skills
		3	Identify an engineering problem, analyze it and propose a work plan to solve it
		4	Communicate with professional technical presentation skills
310250	**Audit Course 5 Cyber Security**	**1**	Understand and classify various cybercrimes
		2	Understand how criminals plan for the cybercrimes
		3	Apply tools and methods used in cybercrime
		4	Analyze the examples of few case studies of cybercrimes
	Audit Course 5 Professional Ethics and Etiquettes	**1**	Summarize the principles of proper courtesy as they are practiced in the workplace
		2	Apply proper courtesy in different professional situations
		3	Practice and apply appropriate etiquettes in the working environment and day to day life
		4	Build proper practices personal and business communications of Ethics and Etiquettes

	Audit Course 5 MOOC- Learn New Skills (Full stack Developer)	**1**	Design and develop web application using frontend and backend technologies.
		2	CODesign and develop dynamic and scalable web applications
		3	Develop server side scripts
		4	Design and develop projects applying various database techniques
	Audit Course 5 Engineering Economics	**1**	Understand economics, the cost money and management in engineering
		2	Analyze business economics and engineering assets evaluation
		3	Evaluate project cost and its elements for business
		4	Develop financial statements and make business decisions

COURSE PATTERN 2019 TE COMPTER ENGINEERING

TE COMP SEM-VI

Course Code	Course Name	COs	Course Outcomes
310251	Data Science and Big Data Analytics	1	Analyze needs and challenges for Data Science Big Data Analytics
		2	Apply statistics for Big Data Analytics
		3	Apply the lifecycle of Big Data analytics to real world problems
		4	Implement Big Data Analytics using Python programming
		5	Implement data visualization using visualization tools in Python programming
		6	Design and implement Big Databases using the Hadoop ecosystem
310252	Web Technology	1	Implement and analyze behavior of web pages using HTML and CSS
		2	Apply the client side technologies for web development
		3	Analyze the concepts of Servlet and JSP
		4	Analyze the Web services and frameworks
		5	Apply the server side technologies for web development
		6	Create the effective web applications for business functionalities using latest web development platforms

310253	**Artificial Intelligence**	**1**	Identify and apply suitable Intelligent agents for various AI applications
		2	Build smart system using different informed search / uninformed search or heuristic approaches
		3	Identify knowledge associated and represent it by ontological engineering to plan strategy to solve given problem
		4	Apply the suitable algorithms to solve AI problems
		5	Implement ideas underlying modern logical inference systems
		6	Represent complex problems with expressive yet carefully constrained language of representation
310254(A)	**Information Security**	**1**	Model the cyber security threats and apply formal procedures to defend the attacks
		2	Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography
		3	Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms
		4	Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios
		5	Demonstrate the use of standards and cyber laws to enhance Information Security in the development process and infrastructure protection
310254(B)	**Augmented and Virtual Reality**	**1**	Understand the basics of Augmented and Virtual reality systems and list their applications
		2	Describe interface to the Virtual World with the help of input and output devices
		3	Explain representation and rendering system in the context of Virtual Reality
		4	Analyze manipulation, navigation and interaction of elements in the virtual world
		5	Summarize the basic concepts and hardware of Augmented Reality system

		6	Create Mobile Augmented Reality using Augmented Reality techniques and software
310254©	**Cloud Computing**	**1**	Understand the different Cloud Computing environment
		2	Use appropriate data storage technique on Cloud, based on Cloud application
		3	Analyze virtualization technology and install virtualization software
		4	Develop and deploy applications on Cloud
		5	Apply security in cloud applications
		6	Use advance techniques in Cloud Computing
310254(D)	**Software Modelling and Architecture**	**1**	Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
		2	Design and analyze an application using UML modeling as fundamental tool
		3	Evaluate software architectures
		4	Use appropriate architectural styles and software design patterns
		5	Apply appropriate modern tool for designing and modeling
310255	**Internship**	**1**	To demonstrate professional competence through industry internship.
		2	To apply knowledge gained through internships to complete academic activities in a professional manner.
		3	To choose appropriate technology and tools to solve given problem.
		4	To demonstrate abilities of a responsible professional and use ethical practices in day to day life.

		5	Creating network and social circle, and developing relationships with industry people.
		6	To analyze various career opportunities and decide carrier goals.
310259	**Audit Course 6 Digital and Social Media Marketing**	**1**	Understand the fundamentals and importance of digital marketing
		2	Use the power of social media for business marketing
		3	Analyze the effectiveness of digital marketing and social media over traditional process
	Audit Course 6 Sustainable Energy Systems	**1**	Comprehend the importance of Sustainable Energy Systems
		2	Correlate the human population growth and its trend to the natural resource degradation and develop the awareness about his/her role towards Sustainable Energy Systems protection
		3	Identify different types of natural resource pollution and control measures
		4	Correlate the exploitation and utilization of conventional and non-conventional resources
	Audit Course 6 Leadership and Personality Development	**1**	Express effectively through communication and improve listening skills
		2	Develop effective team leadership abilities.
		3	Explore self-motivation and practicing creative/new age thinking.
		4	Operate effectively in heterogeneous teams through the knowledge of team work, people skills and leadership qualities.
	Audit Course 6 Foreign Language (Japanese) Module 4	**1**	Have the ability to communicate confidently and clearly in the Japanese language
		2	Understand the nature of Japanese script

		3	Get introduced to reading, writing and listening skills
		4	Develop interest to pursue further study, work and leisure
	Audit Course 6 Learn New Skills	**1**	CO1: Illustrate the agility and principles
		2	CO2: Understand the software development using agile methodology
		3	CO3: Apply DevOps for the software product development
		4	CO4: Develop software products for early delivery through continual feedback and learning

COURSE PATTERN 2019 BE COMPTER ENGINEERING

BE COMP SEM-VII

Course Code	Course Name	COs	Course Outcomes
410241	Machine Learning	1	Identify the needs and challenges of machine learning for real time applications.
		2	Apply various data pre-processing techniques to simplify and speed up machine learning algorithms.
		3	Select and apply appropriately supervised machine learning algorithms for real time applications.
		4	Implement variants of multi-class classifier and measure its performance.
		5	Compare and contrast different clustering algorithms.
		6	Design a neural network for solving engineering problems.
410243	Blockchain Technology	1	Interpret the fundamentals and basic concepts in Block chain
		2	Compare the working of different block chain platforms
		3	Use Crypto wallet for cryptocurrency based transactions
		4	Analyze the importance of block chain in finding the solution to the real-world problems.
		5	Illustrate the Ethereum public block chain platform
		6	Identify relative application where block chain technology can be effectively used and implemented.

410244(A)	**Elective III**	**1**	Interpret the fundamentals and basic concepts in Block chain
		2	Compare the working of different block chain platforms
		3	Use Crypto wallet for cryptocurrency based transactions
		4	Analyze the importance of block chain in finding the solution to the real-world problems.
		5	Illustrate the Ethereum public block chain platform
		6	Identify relative application where block chain technology can be effectively used and implemented.
410244(A)	**Pervasive Computing**	**1**	Demonstrate fundamental concepts in pervasive computing
		2	Explain pervasive devices and decide appropriate one as per the need of real time applications
		3	Classify and analyze context aware systems for their efficiency in different ICT systems.
		4	Illustrate intelligent systems and generic intelligent interactive applications.
		5	Design HCI systems in pervasive computing environment.
		6	Explore the security challenges and know the role of ethics in the context of pervasive computing.
410244(B)	**Multimedia Techniques**	**1**	Describe the media and supporting devices commonly associated with multimedia information and systems.
		2	Demonstrate the use of content-based information analysis in a multimedia information system.
		3	Critique multimedia presentations in terms of their appropriate use of audio, video, graphics, color, and other information presentation concepts.

		4	Implement a multimedia application using an authoring system.
		5	Understanding of technologies for tracking, navigation and gestural control.
		6	Implement Multimedia Internet of Things Architectures.
410244©	**Cyber Security and Digital Forensics**	**1**	Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
		2	Build appropriate security solutions against cyber-attacks.
		3	Underline the need of digital forensic and role of digital evidences.
		4	Explain rules and types of evidence collection
		5	Analyze, validate and process crime scenes
		6	Identify the methods to generate legal evidence and supporting investigation reports.
410244(D)	**Object oriented Modeling and Design**	**1**	Describe the concepts of object-oriented and basic class modelling
		2	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems
		3	Choose and apply a befitting design pattern for the given problem
		4	To Analyze applications, architectural Styles & software control strategies
		5	To develop Class design Models & choose Legacy Systems.
		6	To Understand Design Patterns

410,244 €	**Digital Signal Processing**	**1**	Understand the mathematical models and representations of DT Signals and Systems
		2	Apply different transforms like Fourier and Z-Transform from applications point of view
		3	Understand the design and implementation of DT systems as DT filters with filter structuresand different transforms.
		4	Demonstrate the knowledge of signals and systems for design and analysis of systems
		5	Apply knowledge and use the signal transforms for digital processing applications
		6	To understand Filtering and Different Filter Structures
410245(A)	**Elective IV Information Retrieval**	**1**	Implement the concept of Information Retrieval
		2	Generate quality information out of retrieved information
		3	Apply techniques such as classification, clustering, and filtering over multimedia to analyze the information
		4	Evaluate and analyze retrieved information
		5	Understand the data in various Application and Extensions of information retrieval
		6	Understand Parallel information retrieving and web structure.
410245(B)	**GPU Programming and Architecture**	**1**	Describe GPU architecture
		2	Write programs using CUDA, identify issues and debug them.
		3	Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication
		4	Write simple programs using OpenCL

		5	Identify efficient parallel programming patterns to solve problems
		6	Explore the modern GPUs architecture and it's Applications.
410245(C)	**Mobile Computing**	**1**	Develop a strong grounding in the fundamentals of mobile Networks
		2	Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
		3	Illustrate Global System for Mobile Communications
		4	Use the 3G/4G technology based network with bandwidth capacity planning, VLR and HLR identification algorithms
		5	Classify network and transport layer of mobile communication
		6	Design & development of various wireless network protocols using simulation tools
410245 (D)	**Software Testing and Quality Assurance**	**1**	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
		2	Design and Develop project test plan, design test cases, test data, and conduct test operations.
		3	Apply recent automation tool for various software testing for testing software.
		4	Apply different approaches of quality management, assurance, and quality standard to software system.
		5	Apply and analyze effectiveness Software Quality Tools.
		6	Apply tools necessary for efficient testing framework.
410,245 €	**Compilers**	**1**	Design and implement a lexical analyzer using LEX tools
		2	Design and implement a syntax analyzer using YACC tools

		3	Understand syntax-directed translation and run-time environment
		4	Generate intermediate codes for high-level statements.
		5	Construct algorithms to produce computer code.
		6	Analyze and transform programs to improve their time and memory efficiency
410248	**Project Work Stage I**	**1**	Solve real life problems by applying knowledge.
		2	Analyze alternative approaches, apply and use most appropriate one for feasible solution.
		3	Write precise reports and technical documents in a nutshell.
		4	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work
		5	Inter-personal relationships, conflict management and leadership quality.
AC7 – I	**Audit Course 7 MOOC-learn New Skill**	**1**	To acquire additional knowledge and skill.
AC7 – II	**Entrepreneurship Development**	**1**	Understand the legalities in product development
		2	Undertake the process of IPR, Trademarks, Copyright and patenting
		3	Understand and apply functional plans
		4	Manage Entrepreneurial Finance
		5	Inculcate managerial skill as an entrepreneur

AC7 – III	**Botnet of Things**	**1**	Implement security as a culture and show mistakes that make applications vulnerable to attacks.
		2	Understand various attacks like DoS, buffer overflow, web specific, database specific, web -spoofing attacks.
		3	Demonstrate skills needed to deal with common programming errors that lead to most security problems and to learn how to develop secure applications
AC7 – IV	**3D Printing**	**1**	Understand the basic knowledge of Shop Floor Safety rules and regulations basics of Machine tools and 3D printing machines
		2	Understand the concept of concept of technical sketching, multi-view drawings, Lettering, tolerance, and metric construction
		3	Identify and Distinguish drafting terminologies and construction of geometrical figures using drawing instruments, procedure to prepare a drawing sheet as per SP-46:2003
		4	Describe and Explain practical aspects to generate detailed and assembly views with dimensions, annotations, in 3D Modeling software.
		5	Apply concepts and Fabricate the simple mechanical parts, prototype/ end use product for 3D Printing
AC7 – V	**Industrial Safety and Environment Consciousnes s**	**1**	Develop the plan for Safety performance
		2	Demonstrate the action plan for accidents and hazards
		3	Apply the safety and security norms in the industry
		4	Evaluate the environmental issues of Industrialization

COURSE PATTERN 2019 BE COMPTER ENGINEERING

BE COMP SEM-VIII

Course Code	Course Name	COs	Course Outcomes
410250	High Performance Computing	1	Understand various Parallel Paradigm
		2	Design and Develop an efficient parallel algorithm to solve given problem
		3	Illustrate data communication operations on various parallel architecture
		4	Analyze and measure performance of modern parallel computing systems
		5	Apply CUDA architecture for parallel programming
		6	Analyze the performance of HPC applications
410251	Deep Learning	1	Understand the basics of Deep Learning and apply the tools to implement deep learning applications
		2	Evaluate the performance of deep learning models (e.g., with respect to the bias-variance trade- off, overfitting and underfitting, estimation of test error).
		3	To apply the technique of Convolution (CNN) and Recurrent Neural Network (RNN) for implementing Deep Learning models
		4	To implement and apply deep generative models.
		5	Construct and apply on-policy reinforcement learning algorithms

		6	To Understand Reinforcement Learning Process
410252(A)	**Natural Language Processing**	**1**	Describe the fundamental concepts of NLP, challenges and issues in NLP
		2	Analyze Natural languages morphologically, syntactical and semantically OR Describe the concepts of morphology, syntax, semantics of natural language
		3	Illustrate various language modelling techniques
		4	Integrate the NLP techniques for the information retrieval task
		5	Demonstrate the use of NLP tools and techniques for text-based processing of natural languages
		6	Develop real world NLP applications
410252 (B)	**Image Processing**	**1**	Apply Relevant Mathematics Required for Digital Image Processing.
		2	Apply Special and Frequency Domain Method for Image Enhancement.
		3	Apply algorithmic approaches for Image segmentation.
		4	Summarize the Concept of Image Compression and Object Recognition.
		5	Explore the Image Restoration Techniques.
		6	Explore the Medical and Satellite Image Processing Applications.
410252©	**Software Defined Networks**	**1**	Interpret the need of Software Defined networking solutions.
		2	Analyze different methodologies for sustainable Software Defined Networking solutions.

		3	Select best practices for design, deploy and troubleshoot of next generation networks.
		4	Develop programmability of network elements.
		5	Demonstrate virtualization and SDN Controllers using Open Flow protocol
		6	Design and develop various applications of SDN
410252(D)	**Advanced Digital Signal Processing**	**1**	Understand and apply different transforms for the design of DT/Digital systems
		2	Explore the knowledge of adaptive filtering and Multi-rate DSP
		3	Design DT systems in the field/area of adaptive filtering, spectral estimation and multi-rate DSP
		4	Explore use of DCT and WT in speech and image processing
		5	Develop algorithms in the field of speech , image processing and other DSP applications
		6	Identify Image Processing Techniques
410253(A)	**Elective VI Pattern Recognition**	**1**	Analyze various type of pattern recognition techniques
		2	Identify and apply various pattern recognition and classification approaches to solve the problems
		3	Evaluate statistical and structural pattern recognition
		4	Percept recent advances in pattern recognition confined to various applications
		5	Implement Bellman's optimality principle and dynamic programming
		6	Analyze Patterns using Genetic Algorithms & Pattern recognition applications.

410253(B)	**Soft Computing**	**1**	Understand requirement of soft computing and be aware of various soft computing techniques.
		2	Understand Artificial Neural Network and its characteristics and implement ANN algorithms.
		3	Understand and Implement Evolutionary Computing Techniques.
		4	Understand the Fuzzy logic and Implement fuzzy algorithms for solving real life problems.
		5	Apply knowledge of Genetic algorithms for problem solving.
		6	Develop hybrid systems for problem solving.
410253©	**Business Intelligence**	**1**	Differentiate the concepts of Decision Support System & Business Intelligence
		2	Use Data Warehouse & Business Architecture to design a BI system.
		3	Build graphical reports
		4	Apply different data preprocessing techniques on dataset
		5	Implement machine learning algorithms as per business needs
		6	Identify role of BI in marketing, logistics, and finance and telecommunication sector
410253(D)	**Quantum Computing**	**1**	To understand the concepts of Quantum Computing
		2	To understand and get exposure to mathematical foundation and quantum mechanics
		3	To understand and implement buiding blocks of Quantum circuits
		4	To understand quantum information, its processing and Simulation tools

		5	To understand basic signal processing algorithms FT, DFT and FFT
		6	To study and solve examples of Quantum Fourier Transforms and their applications
10,256 €	**Project Work Stage II**	**1**	Show evidence of independent investigation
		2	Critically analyze the results and their interpretation.
		3	Report and present the original results in an orderly way and placing the open questions in the right perspective.
		4	Link techniques and results from literature as well as actual research and future research lines with the research.
		5	Appreciate practical implications and constraints of the specialist subject
410257 AC8 – I	**Audit Course 8 Usability Engineering**	**1**	Describe the human centered design process and usability engineering process and their roles in system design and development.
		2	Discuss usability design guidelines, their foundations, assumptions, advantages, and weaknesses.
		3	Design a user interface based on analysis of human needs and prepare a prototype system.
		4	Assess user interfaces using different usability engineering techniques.
		5	Present the design decisions
410257 AC8 – II	**Conversational Interfaces**	**1**	CO1: Develop an effective interface for conversation
		2	CO2: Explore advanced concepts in user interface
410257 AC8 – III	**Social Media And Analytics**	**1**	Develop a far deeper understanding of the changing digital land scape.
		2	Identify some of the latest digital marketing trends and skill sets needed for today's marketer.

		3	Successful planning, prediction, and management of digital marketing campaigns
		4	Assessuserinterfacesusingdifferentusabilityengineeringtechniques.
		5	Implement smart management of different digital assets for marketing needs.
		6	Assess digital marketing as a long term career opportunity.
410257 AC8 – IV	**MOOC-learn New Skill**	**1**	To acquire additional knowledge and skill.
410257 AC8 – V	**Emotional Intelligence**	**1**	Expand your knowledge of emotional patterns in yourself and others
		2	Discover how you can manage your emotions, and positively influence yourself and others
		3	Build more effective relationships with people at work and at home
		4	Positively influence and motivate colleagues, team members, managers
		5	Increase the leadership effectiveness by creating an atmosphere that engages others